VOL. 8, NO. 2
January 31, 1983

Energy Research Abstracts

Abstracts 1509-3907

Technical Information Center
UNITED STATES DEPARTMENT OF ENERGY

CURRENT AWARENESS PUBLICATIONS ON ENERGY

To provide complete coverage of literature related to major Department programs, announcement publications that are comprehensive in their coverage of certain energy fields are issued regularly. All information in these publications, plus additional backup information, is included in the Energy Data Base of the Technical Information Center; all references are also available for machine searching via the on-line retrieval system, DOE/RECON, and the commercial on-line retrieval systems. Descriptions of these current awareness publications, which are supported either directly or indirectly by the DOE, appear below. Department of Energy components may receive the listed publications free from the Technical Information Center, P.O. Box 62, Oak Ridge, TN 37830. Telephone (615) 576-1303; (FTS) 626-1303.

PUBLICATIONS OF THE TECHNICAL INFORMATION CENTER

Energy Abstracts for Policy Analysis (EAPA)

A monthly abstract journal devoted to the analysis of energy research, conservation, and policy. Scope and coverage are limited to substantive articles or reports and emphasize the following: programmatic efforts; legislative, regulatory, and other legal aspects; social, economic, and environmental impacts; regional and sectoral analyses; institutional factors, etc. *EAPA* is available from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402; domestic subscribers $6.00, foreign $7.50 per copy; annual cumulative index, domestic $10.00, foreign $12.50 per copy. The annual subscription price is $70.00 for domestic subscribers and $87.50 for foreign subscribers.

Energy Research Abstracts (ERA)

A comprehensive semimonthly abstract journal devoted to all areas of energy-related information produced by the Department of Energy, other U. S. government organizations, and foreign governments. *ERA* is available to the public on a subscription basis from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402. The subscription rate for the 24 semimonthly issues is $150.00 for domestic subscribers and $187.50 for foreign subscribers. A single issue costs $6.50 (domestic) or $8.15 (foreign).

The following publications are available to the public on a subscription basis from the National Technical Information Service (NTIS), Springfield, Virginia 22161. The annual subscription rate for one volume (calendar) year (12 issues plus cumulative index) is $75.00 for domestic subscribers and $150.00 for subscribers outside the North American continent, except as listed below for *DOE Patents Available for Licensing (PAL)*. A single issue is $7.00 (domestic) and $14.00 (outside the North American continent).

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A monthly abstract journal devoted to information on controlled thermonuclear research. Available as PB83-915300.

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A semimonthly current awareness bulletin devoted to information on the exploration and development of geothermal resources. Available as PB83-914700.

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A semimonthly current awareness bulletin covering the following safety aspects: accident analysis, safety systems, radiation protection, decommissioning and dismantling, and security measures. Available as PB83-913500.

Radioactive Waste Management (RWM)

A semimonthly current awareness bulletin covering the following management aspects: transport and storage, waste processing, waste disposal, waste storage, radioactive effluents, and shipping containers. Available as PB83-902900.

INTERNATIONAL ENERGY PUBLICATIONS

Atomindex (Published in cooperation with the Technical Information Center by the International Atomic Energy Agency, International Nuclear Information System, Vienna, Austria)

A semimonthly abstract journal devoted to information on nuclear science and technology. Through an exchange agreement, IAEA/INIS provides all non-U. S. nuclear information of *Atomindex* to TIC for inclusion in the Energy Data Base; in turn, TIC provides all U. S. nuclear information to IAEA/INIS for inclusion in *Atomindex*. *Atomindex* is available by subscription from UNIPUB, 345 Park Avenue South, New York, NY 10010. The cost of an annual subscription, 24 semimonthly issues and semiannual and annual cumulative indexes, is $290.

Coal Abstracts (Published in cooperation with the Technical Information Center by the International Energy Agency, IEA Coal Research, London, England)

A monthly abstract journal devoted to information on coal. Through an exchange agreement, IEA Coal Research provides all non-U. S. coal information of *Coal Abstracts* to TIC for inclusion in the Energy Data Base; in turn, TIC provides all U. S. coal information to IEA Coal Research for inclusion in *Coal Abstracts*. *Coal Abstracts* is available to Department of Energy components and contractors from the Technical Information Center. Non-DOE organizations may obtain *Coal Abstracts* from IEA Coal Research, Technical Information Service, 14-15 Lower Grosvenor Place, London SW1W 0EX, England, for 100 pounds sterling per year.

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ENERGY RESEARCH ABSTRACTS

ABOUT THE TECHNICAL INFORMATION CENTER

The Technical Information Center in Oak Ridge, Tennessee, has been the national center for scientific and technical information for the Department of Energy (DOE) and its predecessor agencies since 1946. In developing and managing DOE's technical information program, the Center places under bibliographic control not only DOE-originated information but also worldwide literature on scientific and technical advances in the energy field and announces the source and availability of this information. Whereas the literature of science is emphasized, coverage is extended to DOE programmatic, socioeconomic, environmental, legislative/regulatory energy analysis, and policy-related areas. To accomplish this mission, the Center builds and maintains computerized energy-information data bases and disseminates this information via computerized retrieval systems and announcement publications such as abstracting journals, bibliographies, and update journals. Direct access to the Center's most comprehensive data base, the Energy Data Base, is available to the public through commercial on-line bibliographic retrieval systems. The Energy Data Base and many of the Center's energy-related data bases are available to DOE offices and contractors and to other government agencies via DOE/RECON, the Department's on-line information retrieval system. The Center has developed and maintains systems to record and communicate energy-related research-in-progress information, to catalog official DOE issue-and-policy documents, to maintain a register of DOE public communications publications, to track research report deliverables from DOE contractors, and to test and make available DOE-funded computer software programs with scientific and management applications. The Center also maintains a full-scale publishing capability to serve special publication needs of the Department. To effectively manage DOE's technical information resources, the Center's program is one of continual development and evaluation of new information products, systems, and technologies.

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Energy Research Abstracts (ERA) provides abstracting and indexing coverage of all scientific and technical reports, journal articles, conference papers and proceedings, books, patents, theses, and monographs originated by the U. S. Department of Energy, its laboratories, energy centers and contractors. *ERA* also covers other energy information prepared *in report form* by federal and state government organizations, foreign governments, and domestic and foreign universities and research organizations. The user should remain aware that *ERA* coverage of non-report literature is limited to that generated by Department of Energy activity.

ERA is comprehensive in its subject scope, encompassing the DOE's research, development, demonstration, and technological programs resulting from its broad charter for energy sources, supplies, safety, environmental impacts, and regulation.

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ERA is available to the public on a subscription basis from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402. The subscription rate for the 24 semimonthly issues is $150.00 for domestic subscribers and $187.50 for foreign subscribers. A single issue costs $6.50 (domestic) or $8.15 (foreign). The cumulative indexes will be available in microfiche form only. The microfiche may be purchased from the National Technical Information Service, U. S. Department of Commerce, Springfield, Virginia 22161 and from Engineered Systems, P. O. Box 866, Oak Ridge, Tennessee 37830.

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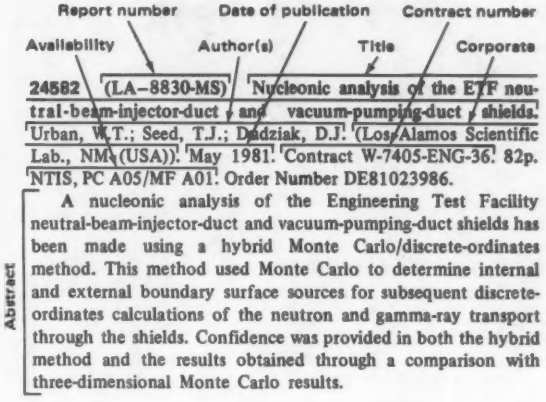
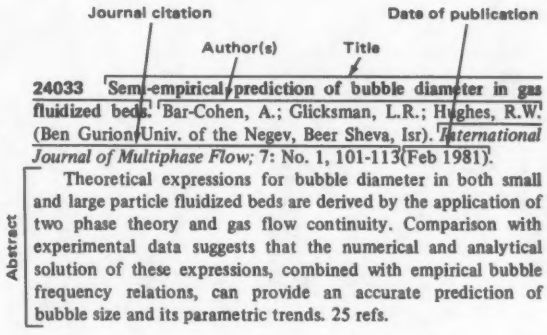

Report number
Date of publication
Contract number
Availability
Author(s)
Title
Corporate
24582 (LA–8830-MS) Nucleonic analysis of the ETF neutral-beam-injector-duct and vacuum-pumping-duct shields. Urban, W.T.; Seed, T.J.; Dudziak, D.J. (Los Alamos Scientific Lab., NM (USA)). May 1981. Contract W-7405-ENG-36. 82p. NTIS, PC A05/MF A01. Order Number DE81023986.
Abstract
A nucleonic analysis of the Engineering Test Facility neutral-beam-injector-duct and vacuum-pumping-duct shields has been made using a hybrid Monte Carlo/discrete-ordinates method. This method used Monte Carlo to determine internal and external boundary surface sources for subsequent discrete-ordinates calculations of the neutron and gamma-ray transport through the shields. Confidence was provided in both the hybrid method and the results obtained through a comparison with three-dimensional Monte Carlo results.


Journal citation
Date of publication
Author(s)
Title
24033 Semi-empirical prediction of bubble diameter in gas fluidized beds. Bar-Cohen, A.; Glicksman, L.R.; Hughes, R.W. (Ben Gurion Univ. of the Negev, Beer Sheva, Isr). International Journal of Multiphase Flow; 7: No. 1, 101-113 (Feb 1981).
Abstract
Theoretical expressions for bubble diameter in both small and large particle fluidized beds are derived by the application of two phase theory and gas flow continuity. Comparison with experimental data suggests that the numerical and analytical solution of these expressions, combined with empirical bubble frequency relations, can provide an accurate prediction of bubble size and its parametric trends. 25 refs.

• INDEXES TO *ENERGY RESEARCH ABSTRACTS*

Five indexes are provided for approaching the contents of each issue of *Energy Research Abstracts (ERA)*. Each index is preceded by an introduction that details the organization of the index and the principles by which it was compiled. The reader is referred to these introductions for information not found in the index examples that follow.

• Corporate Author Index

Technical report literature is indexed using the name of the organization or institution responsible for the issuance of the report.

24582 (LA–8830-MS) Nucleonic analysis of the ETF neutral-beam-injector-duct and vacuum-pumping-duct shields. Urban, W.T.; Seed, T.J.; Dudziak, D.J. **(Los Alamos Scientific Lab., NM (USA)).** May 1981. Contract W-7405-ENG-36. 82p. NTIS, PC A05/MF A01. Order Number DE81023986.

is indexed as:

Los Alamos Scientific Lab., NM (USA)
Nucleonic analysis of the ETF neutral-beam-injector-duct and vacuum-pumping-duct shields, 6:24582 (LA–8830-MS)

• Personal Author Index

Each author's name is indexed in the form appearing on the document abstracted, with the exception that given names are reduced to initials:

Bar-Cohen, A., Semi-empirical prediction of bubble diameter in gas fluidized beds, 7:24033
Dudziak, D.J., *See* Urban, W.T., 6:24582
Glicksman, L.R., *See* Bar-Cohen, A., 7:24033
Hughes, R.W., *See* Bar-Cohen, A., 7:24033
Seed, T.J., *See* Urban, W.T., 6:24582
Urban, W.T., Nucleonic analysis of the ETF neutral-beam-injector-duct and vacuum-pumping-duct shields, 6:24582 (LA–8830-MS)

• Subject Index

The subject index consisting of entries naming specific materials, objects, and processes is arranged alphabetically. Document titles or informative phrases, or both, specific to these entries are arranged alphabetically under the entries.

TOKAMAK ETF
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Nucleonic analysis of the ETF neutral-beam-injector-duct and vacuum-pumping-duct shields, 6:24582 (LA–8830-MS)
Neutron Transport
Nucleonic analysis of the ETF neutral-beam-injector-duct and vacuum-pumping-duct shields, 6:24582 (LA–8830-MS)

• Contract Number Index

DOE technical literature is indexed using contract numbers under which the literature was produced. This index contains the contract number with corresponding abstract and report numbers.

W-7405-ENG-36	**Los Alamos National Lab., NM (USA)**	
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• Report Number Index

Technical report literature is also indexed using report numbers. This index includes information on where individual reports may be obtained. Patents and conference papers are indexed here as a matter of convenience. When a report is supplied under an Order Number, that number is included in the availability statement. An Order Number-Report Number Correlation is included for convenience.

LA–		
8830-MS	6:24582	NTIS, PC A05/MF A01. Order Number DE81023986, Distribution Category STD-20d

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SUBJECT CONTENTS (NUMERICAL LISTING)

Six-digit subject category numbers are used in the storage, retrieval, and manipulation of bibliographic information entered into DOE's computerized bibliographic information system. The six-digit category numbers are utilized as if they were three pairs of two-digit numbers, the first two pairs being used to arrange the abstract content of *Energy Research Abstracts.* The following listing includes the totality of the 40 first-level and 294 second-level subject categories used. Because each issue of *ERA* announces only those documents becoming available during a semimonthly period, some subject categories may not be represented in every issue. The complete subject category scheme with scope notes is available as DOE/TIC-4584-R4 from NTIS for $7.00.

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SUBJECT CONTENTS (ALPHABETICAL LISTING)

Six-digit subject category numbers are used in the storage, retrieval, and manipulation of bibliographic information entered into DOE's computerized bibliographic information system. The six-digit category numbers are utilized as if they were three pairs of two-digit numbers, the first two pairs being used to arrange the abstract content of *Energy Research Abstracts*. The following listing includes the totality of the 40 first-level and 294 second-level subject categories used. Because each issue of *ERA* announces only those documents becoming available during a semimonthly period, some subject categories may not be represented in every issue. The complete subject category scheme with scope notes is available as DOE/TIC-4584-R4 from NTIS for $7.00.

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ENERGY RESEARCH ABSTRACTS

01 COAL AND COAL PRODUCTS

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REFER ALSO TO CITATION(S) 1562, 1562, 1570, 1571, 1572, 1581, 1581, 1584, 1585, 1586, 1587, 1588, 1589, 1595, 1607, 1624, 1626, 1849, 1851, 1852, 1853, 1854, 1855, 1856, 1857, 1867, 2441, 3031, 3032, 3036

1509 (ACD—38391-16) Investigation of high-velocity wedge separator for particle removal in coal-gasification plants. Quarterly report, August 1-October 31, 1978. Linhardt, H.D.; Beveridge, J.H.; Boone, C.G. (Airco Cryogenics, Irvine, CA (USA)). 31 Oct 1978. Contract AC01-77RA02709. 23p. NTIS, PC A02/MF A01. Order Number DE83002854.

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The hot gas test article particle separator design has been upgraded to reflect the results from the ambient analog model. The design is shown on Linhardt and Associates drawing 10003, Figure 2.9. It is sized to collect 1 micron radius particles of density 120 lbs/cu. ft. with a gas at 350 PSIA and 1800°F. The project is moving along the anticipated schedule. Several AAM analog runs have been conducted which substantiated the validity of the wedge separator concept and provided means of hardware improvement prior to manufacturing commitment. Additional AAM runs are scheduled for optimization of aerodynamics in the supersonic portion of the nozzle and the collector slot. The Phase II effort is being directed toward hot gas testing using a seeded-solid gas generator. The test plan is being formulated and the test program nearly finalized. Manufacturing of prototype edge separator elements will commence during the next reporting period.

1510 (AD-A—113805/6) Pitch fractionation. Technical report. Weinberg, V.L.; White, J.L. (Aerospace Corp., El Segundo, CA (USA). Materials Sciences Lab.). 15 Dec 1981. 49p. NTIS, PC A03/MF A01.

Petroleum pitch (Ashland A240) has been subjected to thermal treatment and solvent fractionation to produce refined pitches to be evaluated as impregnants for carbon-carbon composites. The solvent fractions were obtained by sequential Soxhlet extraction with solvents such as hexane, cyclohexane, toluene, and pyridine. The most severe thermal treatment produced a mesophase pitch (approximately 50% mesophase); an appreciable portion of the mesophase was soluble in strong solvents. There were substantial differences in chemical composition and in pyrolysis behavior of the fractions. As the depth of fraction increased, the pyrolysis yield and bloating increased, and the microstructure of the coke became finer until glassy microconstituents were formed in the deepest fractions.

1511 (BMFT-FB-T—82-020) Fundamental research on Fischer-Tropsch-Synthesis. Ritschel, M.; Buschmann, H.W.; Vielstich, W. (Bundesministerium fuer Forschung und Technologie, Bonn (Germany, F.R.)). Jan 1982. 108p. (In German). NTIS (US Sales Only), PC A06/MF A01. Order Number DE82750519.

At the present state of knowledge a detailed comparison of the different processes of coal-refining (e.g. Bergius-Pier, Mobil-Oil, Fischer Tropsch) cannot be carried out. The economics of the Fischer-Tropsch synthesis highly depends on the enhancement of products of technical interest as C_3-C_4-olefines. To get new insights into the mechanism of the Fischer-Tropsch reactions and the distribution of its reaction products on their C-numbers we did investigate the F.T.-synthesis in a laboratory scale reactor, the hydrogenation and the hydrolysis of F.T. catalysts, and the adsorption and desorption of reactants and intermediates. The investigation resulted in the formulation of a reaction mechanism involving carbidic C-atoms. From this mechanism the distribution of the reaction products can be deduced. The validity of this mechanism is demonstrated by the analysis of numerous F.T.-product spectra.

1512 (CONF-820453—3) Single-stage fluidized-bed gasification. Lau, F.S.; Rue, D.M.; Weil, S.A.; Punwani, D.V. (Institute of Gas Technology, Chicago, IL (USA)). Apr 1982. 13p. NTIS, PC A02/MF A01. Order Number DE83900127.

From 5. technical conference on peat; Bethesda, MD, USA (27 Apr 1982).

The single-stage fluidized-bed gasification process, in addition to being a simple system, maximizes gas production and allows the economic exploitation of small peat deposits. The objective of this gasification project is to conduct experiments in order to obtain data for designing a single-stage fluidized-bed gasifier, and to evaluate the economics of converting peat to synthesis gas and to SNG by this process. An existing high-temperature and high-pressure process development unit (PDU) was modified to permit the direct feeding of peat to the fluidized bed. Peat flows by gravity from the feed hopper through a 6-inch line to the screw-feeder conveyor. From there, it is fed to the bottom tee section of the reactor and transported into the gasification zone. Oxygen and steam are fed through a distributing ring into the reactor. Gasification reactions occur in the annulus formed by the reactor tube and a central standpipe. Peat ash is discharged from the reactor by overflowing into the standpipe and is collected in a solids receiver. All process steams are measured and sampled for data analysis. A total of 24 tests have been conducted in this unit; detailed results of all tests have been published. Peats from Minnesota, Maine, and North Carolina were tested. Tables 1 and 2 summarize the operating ranges used and the product yields achieved in these tests. A wide range of operating conditions was tested. The following discussion of results is directed toward the Minnesota peat tests. Several conclusions can be drawn: high peat conversions (> 90%) can be achieved under relatively mild conditions. Pressure has no apparent effect on conversion. Low oil yields, less than 1% of the feed carbon, were obtained as expected with the bottom feed configuration. External steam feed was not required to achieve high carbon conversions. Apparently, sufficient reaction steam is produced during peat devolatilization.

1513 (CONF-820610—12) Medium-Btu gas from coal by the IGT U-Gas process. Rehmat, A.; Vora, M.K.; Bryan, B.G. (Institute of Gas Technology, Chicago, IL (USA)). 1982. 16p. NTIS, PC A02/MF A01. Order Number DE82022185.

From American Institute of Chemical Engineers' spring meeting; Anaheim, CA, USA (8 Jun 1982).

The Institute of Gas Technology's (IGT) U-GAS process for medium-Btu fuel gas offers a means to produce a clean fuel from coal with minimal environmental impact. The U-GAS process uses an ash agglomeration mechanism in a single-stage fluidized bed coal gasifier to achieve high coal conversions. The U-GAS pilot plant has been operated since 1974 in support of the U-GAS process development. During this time, several types of coal and char have been successfully gasified with coal conversion efficiencies as high as 98.5%. In over 10,000 hours of total operation, 123 pilot plant tests have been completed with 1859 tons (1693 Mg) of coals gasified. Steady-state operations at pressures up to 60 psia (413 kPa) and temperatures up to 2000°F (1093°C) have produced a good quality fuel gas with a heating value as high as 284 Btu/SCF (10,579 kJ/m³). Through this extensive testing and development program, the U-GAS process feasibility has been firmly established and an extensive data base acquired for scale-up. A commercial plant to produce medium-Btu gas from coal using this process will

be built near Memphis, Tennessee. The fuel gas produced will be supplied to industrial customers via a short distance pipeline in the Memphis area.

1514 **(CONF-820612—11) Solids flow control and measurement in the PEATGAS pilot-plant program.** Wohadlo, S.J.; Biljetina, R.; Laurens, R.M.; Bachta, R. (Institute of Gas Technology, Chicago, IL (USA)). 1982. 10p. NTIS, PC A02/MF A01. Order Number DE82021132.

From Symposium on instrumentation and control for fossil energy processes; Houston, TX, USA (7 Jun 1982).

In a pilot plant gasification program, the measurement and control of major process variables such as flow, temperature, pressure, density and level are essential to develop accurate material balance and reliable scale-up data. Of these, solids mass flow metering and control usually present the most difficult application. Problems are encountered because of (a) solids characteristics, which can cause erosion and plugging; (b) measurement requirements, which are often at elevated pressures and temperatures; and (c) changes in stream characteristics, such as density, viscosity and solids concentration. This paper reviews the approaches used to measure and control solid-liquid and solid-gas mixtures and elaborates on the design, installation and operating experiences of a lockhopper dry feed system commissioned to control solids feed to the gasifier. Accurate and reliable solids flow measurement and control was achieved during the operation of the PEATGAS pilot plant. Standard instrumentation, modified to meet process requirements, was used to measure multi-component flows of solid-gas and solid-liquid mixtures. In addition, a lockhopper feed system using an innovative solids rate control and measurement technique was installed, commissioned and operated. IGT as a process developer will continue to look for new or improved instrumentation that might be better suited to measure important process variables such as the solids mass flow applications discussed herein.

1515 **(CONF-820814—31) PEATGAS pilot plant operating results.** Biljetina, R.; Punwani, D. (Institute of Gas Technology, Chicago, IL (USA)). 1982. 6p. NTIS, PC A02/MF A01. Order Number DE82021066.

From 17. Intersociety Energy Conversion Engineering conference; Los Angeles, CA, USA (8 Aug 1982).

Portions of document are illegible.

The Institute of Gas Technology has been developing the PEATGAS process for the conversion of peat to synthetic fuels. A program has recently been completed for the pilot-plant-scale testing of the process. In this scheme, peat is gasified in a two-stage reactor system, which operates at temperatures up to 1750°F and pressures up to 500 psig. The process can be controlled to maximize the production of either substitute natural gas (SNG) or liquid hydrocarbons. The technical feasibility of the process was demonstrated in a series of five gasification tests. Highlights of this operating program are presented in this paper.

1516 **(DOE/ET/10069—T22) EDS coal-liquefaction process development, Phase V: EDS product quality. Final report.** Epperly, W.R. (Exxon Research and Engineering Co., Florham Park, NJ (USA)). Sep 1982. Contract FC05-77ET10069. 266p. (FE—2893-97). NTIS (US Sales Only), PC A12/MF A01. Order Number DE83002226.

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The laboratory product quality studies were conducted at various Exxon Research and Engineering (ER and E) facilities. This Final Product Quality Report summarizes research efforts directed at end-use applications of raw and upgraded EDS products. The end-use applications, including any upgrading by hydrotreatment required to ensure adequate performance, are identified for products derived from Illinois (Monterey mine) and Wyoming (Wyodak mine) coals. The results presented are intended to update and supplement information reported previously for these products in EDS Product Quality Interim Report, FE-2893-68, March 1981. The broad objectives of EDS product quality studies are to identify potential end-uses for coal-derived liquids and to evaluate properties of these liquids relative to requirements of these potential applications. Areas pertaining to product quality requiring further development are highlighted. Consideration of future market needs combined with generic properties of EDS-derived products may suggest a clean product slate (naphtha/distillate) as the most desirable, long-range EDS product objective. Properties of lighter EDS product streams (naphtha, distillates) are essentially independent of liquefaction operating conditions for a given coal. This applies to both coal-only and bottoms recycle operations. With the exception of heterocyclic content, primarily sulfur, properties of lighter EDS product streams (naphtha, distillates) are very nearly coal-independent.

1517 **(DOE/ET/10152—79) Bench unit preheater study using Amocat 1A catalyst.** (Hydrocarbon Research, Inc., Lawrenceville, NJ (USA)). Oct 1982. Contract AC05-77ET10152. 48p. (FE—10152-79). NTIS, PC A03/MF A01. Order Number DE83001736.

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Under DOE Contract DE-AC05-77ET-10152, HRI is investigating the thermal dissolution of coal and its effects on the mechanism of catalytic coal liquefaction in an H-COAL system. The two-stage coal liquefaction system consists of a coal slurry preheater which is essentially a short residence time reactor and the liquefaction reactor which can be regarded as a catalytic-hydrogenation reactor. The bench unit operation tested Amocat 1A catalyst in the modified bench-unit operations with Illinois No. 6 coal, using a catalytic temperature 15°F lower than had been used in earlier bench unit tests with this catalyst. The yield of residual oil from this operation was 10% greater than would have been expected on the basis of earlier bench-unit operations with this coal and catalyst, although such comparison is highly dependent on correlated extrapolation of the earlier work. The interrelation of product distribution and hydrogen requirement in this Amocat 1A operation was approximately the same as in the bench-unit (with preheater) operation with the standard catalyst, although feed space velocity would be 40% lower in the Amocat 1A operation because of the lower temperature used. This work indicates little pre-reaction of coal and residual oil in the preheater as operated in this run, with a nominal preheater slurry residence time of two minutes and a linear temperature profile to an outlet temperature of 750°F. This work has shown that considerably higher severities are required in the thermal stage to effect a substantial impact upon the results of the catalytic stage.

1518 **(DOE/ET/10152—84) Microautoclave analysis.** (Hydrocarbon Research, Inc., Lawrenceville, NJ (USA)). Oct 1982. Contract AC05-77ET10152. 90p. NTIS, PC A05/MF A01. Order Number DE83002115.

This program was conducted at Hydrocarbon Research, Inc. (HRI) in support of other Phase III tasks. The purpose was to employ the microautoclave as a guidance tool for the bench program. Results from the microautoclave were used to evaluate bench products and to determine proper operating conditions for the bench tests. Experience gained in this program was applied to the support of the Pilot Plant operations in Catlettsburg, Kentucky. This program was conducted with the microautoclave apparatus and was divided into four phases. In Phase I thermal dissolution of Illinois No. 6 coal was explored. In Phase II thermal dissolution of Wyodak coal was studied. Catalyst testing for these coals was evaluated in Phase III. In a final phase recycle solvent quality of bench products was explored. Recycle resids and distillates from PDU Runs 5 and 10 were also studied. HRI established a definitive test procedure to evaluate the thermal liquefaction behavior of coals. This test allows an assessment of thermal coal dissolution with a standard test solvent under a variety of thermal conditions. It also permits an assessment of hydrogen donor capacity of a solvent with a given coal, compared to a standard, by measuring the conversion under a number of different thermal conditions. HRI has determined that solvent quality tests should be conducted in at least a four-point thermal test matrix and that thermal coal dissolution evaluation requires at least a 10 to 15 point test matrix.

1519 **(DOE/ET/10159—T9) Coal feeder survey for Illinois coal gasification group.** Alfi, A.; Fukuzawa, J.; Rezos, A. (UOP/SDC, Joint Venture, McLean, VA (USA)). 15 May 1979. Contract AC01-78ET10159. 76p. NTIS, PC A05/MF A01. Order Number DE83000829.

An evaluation of three coal feeder concepts (lockhopper, Fuller Kinyon screw and Foster Miller pocket feeder) for use in the ICGG first stage gasifier was made. For the sake of consisten-

cy, all feed concepts were evaluated on the same basis, that is, feeding a nominal 100 Tons per hour (TPH) against a back pressure of 50 psig. Also, all feed systems were assumed to have similar atmospheric storage hoppers and final injection systems. Accordingly, no further consideration of these support systems was made. This survey was accomplished by reviewing the literature, interviewing vendors, contacting applicable facilities and performing necessary original analysis. The emphasis of the survey was on the test and industrial experience of each system. The results of this survey which are summarized on Table I show that the lockhopper system still should be considered as the baseline system because it is a proven system with extensive operating experience. On the other hand, if definitive tests can prove conclusively that the Fuller Kinyon screw pump will deliver coal against 50 psig back pressure with acceptable efficiencies and coal particle attrition characteristics, it would be the preferred system because it is the lowest cost and easiest to maintain. The Foster Miller linear pocket feeder is an excellent innovative solution to the coal feeder problem. This design, however, is more suited for use in feeding against much higher pressures than the 50 psig required in this application.

1520 **(DOE/ET/10159—T10) Future use of BI-GAS facility. Final report, Part II.** (UOP/SDC, Joint Venture, McLean, VA (USA)). Sep 1981. Contract AC01-78ET10159. 117p. D. Order Number DE83000830.

Portions of document are illegible.

The 120 tpd BI-GAS pilot plant, intended to produce SNG at high pressure, was completed in 1976. For the next three and a half years, the operator, Stearns-Roger Inc., was engaged in operating the plant while overcoming a series of mechanical problems that have prevented the plant from running at design capacity and pressure. Since July 1980, these problems have apparently been corrected and considerable progress was made. In late 1979, the Yates Congressional Committee directed DOE to investigate the possibility of establishing an entrained-bed gasifier test facility at the site. In January 1981, the DOE established a study group composed of DOE and UOP/SDC personnel to determine how best to use the BI-GAS facility. The group considered four possibilities: Continue operation of the facility in accordance with the technical program plan developed by DOE and Stearns-Roger; modify the plant into an entrained-bed facility for testing components and processes; mothball the facility, or dismantle the facility. The group took the view that modifying the plant into a test facility would increase substantially the amount of engineering data available to the designers of commercial gasification plants. Since it appears that syngas plants will be of commercial interest sooner than SNG plants will, it was decided that the facility should test syngas production components and processes at high pressure. Consequently, it was recommended that: Operation of the plant be continued, both to collect data and to prove the BI-GAS process, as long as the schedule of the technical program plan is met; Begin at once to prepare a detailed design for modifying the BI-GAS plant to a high-pressure, entrained flow syngas test facility; and Implement the modification plan as soon as the BI-GAS process is proven or it becomes apparent that progress is unsatisfactory.

1521 **(DOE/ET/10159—T12) Crude-oil vs coal-oil processing comparison study. Final report.** (UOP/SDC, Joint Venture, McLean, VA (USA)). Nov 1979. Contract AC01-78ET10159. 76p. NTIS, PC A05/MF A01. Order Number DE83000825.

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This study evaluates three refinery schemes that have been developed for the processing of H-Coal liquids. The refinery processing employed for the naphtha and lighter components of the H-Coal liquid is essentially the same for all three schemes. It is in the processing of the H-Coal distillate product that refinery variations occur, and these differences are outlined: hydrotreating of the middle coal distillate to produce a No. 2 fuel oil equivalent product; hydrocracking of the total coal distillate to produce more gasoline and higher quality distillate fuel; and hydrotreating of the light coal distillate to a No. 2 fuel oil equivalent, and hydrogenating the heavy coal distillate to upgrade feedstock to a fluid catalytic cracking (FCC) unit. To provide a perspective of the value of coal liquid relative to petroleum, a parallel set of petroleum refinery schemes, processing a 65/35 Light/Heavy Arabian crude oil blend, was developed: reduced crude desulfurization with FCC processing of the desulfurized VGO; reduced crude desulfurization with hydrocracking of the desulfurized VGO; solvent demetallization of the vacuum pitch with desulfurization and FCC processing of VGO and demetallized oil; and solvent demetallization of the vacuum pitch with hydrocracking of the VGO and demetallized oil. Various gasoline to distillate ratios were set as parameters in developing the best possible processing schemes. Linear programming techniques were used to select the optimal schemes at various product ratios. Applying the same product prices to all cases and subtracting operating costs and the capital change, a comparative feedstock value is calculated. This method places the various refinery schemes on a common basis and gives an appraisal of the relative value of the H-Coal liquid charge stock, based on new refinery facilities.

1522 **(DOE/ET/10159—T13) Evaluation of the Rockwell International flash-hydroliquefaction process. Final summary report.** Sirohi, V.P. (UOP/SDC, Joint Venture, McLean, VA (USA)). Sep 1980. Contract AC01-78ET10159. 108p. D. Order Number DE83000826.

Portions of document are illegible.

At the request of the Department of Energy, UOP/SDC has evaluated the Rockwell Hydroliquefaction Process to determine the adequacy of the existing PDU data base and to assess the practicability and operability of the process. UOP/SDC conducted nine studies. Their findings follow: (1) A complete designed set of experiments must be run on the present PDU to make possible satisfactory analysis of the effects of variables especially the effect of diluents in the H_2 feed and the possibility of carbon deposition problems. (2) Basic improvements in the equipment and operation of the PDU should first be made (Ten specific recommendations are made). (3) A reactor design concept must be developed that looks feasible for design, fabrication, and operation. (4) A conceptual commercial design and economics should be prepared based on a realistic set of design bases and criteria. (5) If the above are accomplished successfully with attractive results, then and only then: (a) A study should be made of the refining requirements of the product, which are expected to be expensive based on the H/C ratio. (b) The PDU should be modified for continuous runs of up to one month to: Confirm the data correlations, estimate the reliability of the reactor and process, adhere to the requirements stated above, test cryogenic gas separation, study fouling and erosion, study lockhopper feeding, establish initial reliability of the coal injector and precombustion assembly head, collect scale-up and design data, and conduct a materials study and confirm materials choices. (c) Determine particle size of the char and of the solids in the oil product, the degree to which they may be separated, and how the ash should be removed from the product oil.

1523 **(DOE/ET/10159—T14) Analysis of thermal efficiency for hydrogasification and gasification/methanation.** DiNapoli, R.N. (UOP/SDC, Joint Venture, McLean, VA (USA)). 21 Dec 1979. Contract AC01-78ET10159. 20p. NTIS, PC A02/MF A01. Order Number DE83000827.

To confirm the potentially greater thermodynamic efficiency of hydrogasification, a study was made of carbon conversion and resulting thermal efficiency of methane production via hydrogasification as compared to gasification/methanation. The alternative systems were first compared on an ideal process basis. This approach neglects limitations imposed by the thermodynamics and kinetics of the various chemical reactions and indicates maximum potential conversion of coal to methane. These results were then compared with similar data for commercial plant designs developed for each of the processes that take into account system inefficiencies and thermodynamic restraints. Ideally, carbon conversions of 20 to 30% higher than given by gasification/methanation can be achieved by hydrogasification, resulting in 20 to 30% higher thermal efficiencies. Unfortunately, the full extent of this advantage is not realized because the carbon-hydrogen-methane reaction equilibrium is not favorable to high methane concentrations at the high temperatures required for gasification of coal in a single stage process. This limitation is overcome by the use of a large excess of hydrogen, which favors increased carbon conversion within the required gasification temperature range but reduces thermal efficiency. A comparison of both the cold gas (methane production only) and overall (methane plus byproducts) thermal efficiencies for the conceptual plant design developed by UOP/SDC for the Rockwell process with a

similar plant design published for the Lurgi gasification/methanation process does, however, show about a 5% higher thermal efficiency for the Rockwell hydrogasification process.

1524 **(DOE/ET/10159—T16) Lummus clean fuels from coal.** Gantt, J.E.; Hefferan, J.K.; Chorba, W.F.; Schachtschneider, A.B.; Schulze, J.R. (UOP/SDC, Joint Venture, McLean, VA (USA)). Dec 1980. Contract AC01-78ET10159. 99p. NTIS, PC A05/MF A01. Order Number DE83000823.

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This report compares two direct, catalytic, hydroliquefaction processes - H-Coal and Lummus Clean Fuels From Coal (LCFFC). These processes are compared for two sets of operating conditions. In the first, the reactors are operated to produce a product suitable for use as fuel oil (fuel oil mode). In the second, the operating conditions are more severe, so the resulting product slates more closely resemble crude oil (syncrude mode). The comparisons are performed using conceptual designs based on single point run data, with a design basis of 25,000 tpd (moisture-free basis) of Illinois No. 6 coal. Although all cost comparisons are well within the estimated 25% accuracy of the estimates, LCFFC shows generally lower costs. Three types of economic evaluation are performed: computation of internal rate of return (IRR) with product values set to estimated market value, computation of overall average product cost ($/MM Btu) with the discount rate set at 20%, and calculation of average product cost with naphtha credited at estimated market value and the discount rate set at 20%. H-Coal has a lower cost only in the fuel oil mode analysis with naphtha valued at market price. The processes are also compared with respect to the potential for commercialization and anticipated operability differences. It is concluded that the lower hydrogen content of LCFFC product may offset its advantage of lower cost if it is used as refinery feed, and that the design of the LCFFC reactor may make it harder to control. Suggestions for future research are presented.

1525 **(DOE/ET/12547—2) Coal desulfurization by chlorinolysis: production and combustion-test evaluation of product coals. Final report.** Kalvinskas, J.; Daly, D. (Jet Propulsion Lab., Pasadena, CA (USA)). 30 Apr 1982. Contract AI01-77ET12547. 78p. (JPL-PUBL—82-72). NTIS, PC A05/MF A01. Order Number DE83001427.

Laboratory-scale screening tests were carried out on PSOC 276, Pittsburgh Coal from Harrison County, Ohio to establish chlorination and hydrodesulfurization conditions for the batch reactor production of chlorinolysis and chlorinolysis-hydrodesulfurized coals. In addition, three bituminous coals, Pittsburgh No. 8 from Greene County, PA, Illinois No. 6 from Jackson County, Illinois and Eagle No. 5 from Moffat County, Colorado were treated on the lab scale by the chlorinolysis process to provide 39 to 62% desulfurization. Two bituminous coals (PSOC 276, Pittsburgh Coal from Harrison County, Ohio and 282, Illinois No. 6 Coal from Jefferson County, Illinois) and one subbituminous coal (PSOC 230, Rosebud Coal fom Rosebud County, Montana) were then produced in 11 to 15 pound lots as chlorinolysis and hydrodesulfurized coals. The chlorinolysis coals had a desulfurization of 29 to 69%, reductions in volatiles (12 to 37%) and hydrogen (6 to 31%). Hydrodesulfurization provided a much greater desulfurization (56 to 86%), reductions in volatiles (77 to 84%) and hydrogen (56 to 64%). The three coals were combustion tested in the Penn State plane flame furance to determine ignition and burning characteristics. All three coals burned well to completion as: raw coals, chlorinolysis processed coals and hydrodesulfurized coals. The hydrodesulfurized coals experienced greater ignition delays and reduced burning rates than the other coals because of the reduced volatile content. It is thought that the increased open pore volume in the desulfurized-devolatilized coals compensates in part for the decreased volatiles effect on ignition and burning. 4 figures, 2 tables.

1526 **(DOE/FE/05121—T4) Design, construction, and operation of a process-development unit for the high-rate, entrained-flow coal-gasification process. Quarterly technical progress report No. 5, April-June 1982.** (Mountain Fuel Resources, Inc., Salt Lake City, UT (USA)). 1982. Contract AC21-81FE05121. 32p. NTIS, PC A03/MF A01. Order Number DE83001280.

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Mountain Fuel Resources, Inc., a subsidiary of Mountain Fuel Supply Company, Salt Lake City, Utah, is under contract with the US Department of Energy to design, construct and operate a high-rate, entrained flow coal gasification process development unit (PDU). The objective is to develop equipment for gasification of coal to form a clean, intermediate-Btu fuel gas or synthesis gas that may be converted to methyl alcohol, gasoline, synthetic natural gas or many other desirable products. Ford, Bacon and Davis Utah, Inc., is the principal subcontractor on the program, and will be largely responsible for design, construction and operation of the PDU. The design of the coal gasification PDU is based on earlier DOE-supported work at the Eyring Research Institute, Provo, Utah. Pulverized coal is fed to an entrained flow reactor where it is gasified by reaction with steam and oxygen. The ash in the coal is removed as an inert slag and the product gas may be cleaned to remove sulfur-containing compounds and carbon dioxide to yield a clean fuel gas with a heating value near 300 Btu/standard cubic foot. The PDU is to be located adjacent to a brick plant operated by Interstate Brick Company in West Jordan, Utah. Interstate Brick is also a subsidiary of Mountain Fuel Supply Company. Detailed design was essentially completed during this reporting period.

1527 **(DOE/MC/14603—T12) Quarterly report, January-March 1982.** (Conspray Construction Systems, Inc., Santa Ana, CA (USA)). 1982. Contract AC21-80MC14603. 36p. NTIS, PC A03/MF A01. Order Number DE82014478.

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The Proof of Concept tests were initiated in January. During the quarter, over 40 tons of coal were pumped, with slightly under half at zero psi to establish performance baselines, about 10 tons at 300 and 600 psi each, and 1 1/2 tons at 900 psi. Feedstocks tested included 3/4″ Utah bituminous, minus 100 mesh Utah bituminous, 1 1/2″ Illinois bituminous, 1/4″ West Virginia bituminous with 40% 1/4″ dolomite additive, and 1″ Texas lignite. The moisture levels ranged from 2.5% to 28.8%. Turndown tests were conducted by varying the feeder piston stroke, using strokes of 6″, 12″ and 18″ (full stroke). Moisture tolerance tests have been limited by the inability of the live bottom storage hoppers to reliably discharge coal into the feeder hopper. In general, the chunk coals feed well over a wide range of moisture. However, even slight addition of water causes the finer coals to develop a caking, pasting characteristic that prevents the material from flowing readily. The data sheets document the specific moisture levels. Initially, considerable effort was expended to control moisture. However, difficulties in discharging wet powdered coal from the storage hoppers and removing various feestocks from the pressure vessels were simply consuming an inordinate amount of time, and this effort was not deemed productive. The feeder was able to feed any material which could be loaded into the hopper. Once this fact was demonstrated, it was decided to feed the coal in as received moisture condition as this would probably be the desired situation in a commercial application.

1528 **(DOE/MC/16026—3-4) Coal gasification and tar conversion reactions over calcium oxide. Quarterly progress reports, February 1, 1982-July 31, 1982.** Longwell, J.P.; Chang, C.S.; Peters, W.A. (Massachusetts Inst. of Tech., Cambridge (USA)). Sep 1982. Contract AC21-81MC16026. 21p. NTIS, PC A02/MF A01. Order Number DE83001325.

Construction and debugging of the experimental system was completed in this period. Preliminary runs showed that the system can be operated satisfactorily according to our design specifications. An experimental system to automate gas sampling and analysis was installed. This will allow changes in gas compositions to be interrogated at 12 to 15 predetermined times during the course of a run. An analytical technique for determining the concentrations of phenolic groups in coal tars was identified and will be employed in this study. Most of the work during this period was devoted to developing procedures for generating packed beds of active CaO that exhibited minimal variation in stone surface area along their axis. A 2-step calcination protocol shows promise for achieving this goal.

1529 **(DOE/MC/16372—5) Simultaneous high-temperature removal of alkali and particulates in a pressurized gasification system. Fifth quarterly project report, April 1982-June 1982.** Mulik, P.R.; Alvin, M.A.; Bachovchin, D.M. (Westinghouse Electric Corp., Pittsburgh, PA (USA). Research and Development Center). Jul 1982. Contract AC21-81MC16372. 24p. NTIS, PC A02/MF A01. Order Number DE83001629.

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This program is directed at performing experimental and analytical investigations, deriving system designs, and estimating costs to ascertain the feasibility of using aluminosilicate-based getters for controlling alkali in pressurized gasification systems. Its overall objective is to develop a comprehensive plan for evaluating a scaled-up version of the gettering process as a unit operation or as an integral part of a particulate removal device. This report briefly summarizes efforts previously completed on thermodynamic projections and system performance projections, together with current work on getter selection and qualification completed during the fifth quarter of the project. Work on the thermodynamic projections has been completed and includes an update of the data base, development of alkali phase diagrams, and projections for several gasification processes. Getter selection and qualification efforts involved four tests - two with activated bauxite and one each with diatomaceous earth and Novacite on the thermogravimetric analysis (TGA) system. Finally, system performance projections entailed examination of available kinetic data to ascertain the rate-controlling step, along with modeling efforts to determine the size requirements of a commercial-sized unit.

1530 **(DOE/NASA/10350—30) Literature survey of properties of synfuels derived from coal.** Flores, F. (National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center). Aug 1982. Contract AI01-77ET10350. 184p. (NASA-TM—82739). NTIS, PC A09/MF A01. Order Number DE82022524.

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This report contains the results of a literature survey conducted by NASA Lewis Research Center. The survey objective was to systematically assemble existing data on the physical, chemical, and elemental composition and structural characteristics of synthetic fuels (liquids and gases) derived from coal. The report contains the survey results compiled to October 1980. The report includes the following: (1) a general description of fuel properties, with emphasis on those properties required for synfuels to be used in gas-turbine systems for industry and utilities; (2) description of the four major concepts for converting coal into liquid fuels (pyrolysis, solvent extraction, catalytic liquefaction and indirect liquefaction); (3) data obtained from the literature on full range syncrudes and certain distillate cuts for fuels derived by various processes; (4) description of upgrading processes for coal liquids and characterization data for upgraded fuels; (5) data plots illustrating trends in the properties of fuels derived by several processes; (6) description of the most important concepts in coal gasification (fixed bed, fluidized bed, entrained flow and underground gasification) and characterization data for coal-derived gases; (7) a source list and bibliography on syncrude production and upgrading programs; and (8) a listing of some Federal energy contracts for coal-derived synthetic fuels production.

1531 **(DOE/OR/03054—T13-Vol.1) SRC-I Project Baseline.** (International Coal Refining Co., Allentown, PA (USA)). Mar 1982. Contract AC05-78OR03054. 474p. NTIS, PC A20/MF A01. Order Number DE83000986.

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International Coal Refining Company (ICRC), in cooperation with the Commonwealth of Kentucky has contracted with the United States Department of Energy (DOE) to design, build and operate a first-of-its kind plant demonstrating the economic, environmental, socioeconomic and technical feasibility of direct coal liquefaction process known as SRC-I. ICRC has made a massive commitment of time and expertise to design, plan and formulate policy, schedules, costs and technical drawings for all plant systems. These fully integrated plans comprise the Project Baseline and are the basis for all plant construction, operation, and other work set forth in the contract between ICRC and the DOE. Volumes I and II of the accompanying documents constitute the Project Baseline for the SRC-I two-stage liquefaction plant. International Coal Refining Company believes this versatile plant design incorporates the most advanced coal liquefaction systems available in the synthetic fuels field. SRC-I two-stage liquefaction, as developed by ICRC, is the way of the future in coal liquefaction because of its product slate flexibility, high process thermal efficiency, and low consumption of hydrogen. The SRC-I Project Baseline design also has made important state-of-the-art advances in areas such as environmental control systems. The Baseline reflects ICRC's commitment to assure the SRC-I plant meets all applicable environmental standards. In completing the Project Baseline, International Coal Refining Company has succeeded in translating the project goal of protecting human health and the environment into a series of specific design and operating innovations. Taken together, these provisions represent a major commitment to environmental quality.

1532 **(DOE/OR/03054—T13-Vol.2) SRC-I Project Baseline.** (International Coal Refining Co., Allentown, PA (USA)). Mar 1982. Contract AC05-78OR03054. 323p. NTIS, PC A14/MF A01. Order Number DE83000987.

The Process Design Criteria Specification forms the basis for process design for the 6000-TPSD SRC-I Demonstration Plant. It sets forth: basic engineering data, e.g., type and size of plant, feedstocks, product specifications, and atmospheric emission and waste disposal limits; utility conditions; equipment design criteria and sparing philosophy; and estimating criteria for economic considerations. Previously the formal ICRC Document No. 0001-01-002 has been submitted to DOE and revised, as necessary, to be consistent with the SRC-I Project Baseline. Revision 6, dated 19 March 1982, 51 pages, was forwarded to DOE on 19 March 1982.

1533 **(DOE/PC/30018—2) Flash hydroliquefaction of coal. Quarterly technical progress report No. 2, 1 January 1981-3 April 1981.** Falk, A.Y. (Rockwell International Corp., Canoga Park, CA (USA). Energy Systems Group). 31 Mar 1982. Contract AC22-80PC30018. 66p. (ESG-DOE—13383). NTIS, PC A04/MF A01. Order Number DE82021781.

A schedule for Phase IV of the program is presented in Figure 1. The program is divided into four major tasks: Task 1 - existing PDU studies, Task 2 - support studies, Task 3 - continuous facility engineering design (an optional task), and Task 4 - program management. For Task 1, the PDU has been activated, and Phase IV testing was begun during February 1981. Six successful PDU tests have been conducted; these are the first of the ~ 40 tests planned for Phase IV. Testing in a 300-ms-residence-time reactor has been completed, and a 600-ms reactor is being installed. Testing with the larger reactor will resume in early April 1981. In general, the system appears to be operating well. Carbon, hydrogen, and ash recoveries/balances on an as-collected basis are ~ 95, ~ 99, and ~ 98, respectively. These as-collected carbon and ash recoveries are substantially better than those obtained during the Phase III testing (1979 to 1980). The dense-phase flow system is operating as designed (Task 2.2), and testing is progressing well. In addition, the PDU coal feed system has been calibrated, the effect of feed tank pressurization rate on solids flowability has been studied, and preliminary checkout testing of the Micro Motion flowmeter for measuring coal flow rate has been conducted. A plan for the work to be conducted in Task 2.3 (product refining and utilization studies) has been prepared and was submitted to the DOE project manager for review and approval.

1534 **(DOE/PC/30249—T4) Development of a thermodynamic-properties-correlation framework for the coal-conversion industry, Phase IIA. Second annual report, September 1, 1981-August 31, 1982.** Starling, K.E.; Lee, L.L.; Kumar, K.H.; Watanasiri, S.; Brule, M.R.; Luong, T.; Kache, A.; Owens, V.; Tran, T.; So, C.K. (Oklahoma Univ., Norman (USA). School of Chemical Engineering and Materials Science). 1982. Contract FG22-80PC30249. 7p. NTIS, PC A02/MF A01. Order Number DE82020968.

During the second year, a multiparameter corresponding states correlation was developed for nonpolar, polar, and associating pure coal chemicals. The polar and associating effects were characterized by reduced dipole moment and three polar/associ-

ative parameters. The new correlation predicts vapor pressure and density of 28 polar and associating pure coal compounds, and 23 other highly polar and associating compounds with reasonable levels of accuracy. The correlation is suitable for application to coal fluid mixtures. The new correlation is presently used as a framework for the study of mixture composition dependence.

1535 **(DOE/PC/30337—T1) Mutagenicity testing for RCRA of residuals produced in the conversion of coal. Final report.** (Pittsburgh Univ., PA (USA)). 1982. Contract AC22-80PC30337. 58p. NTIS, PC A04/MF A01. Order Number DE82019766.

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Data from either direct or S-9 activated sample testing in the CHO system does not demonstrate a significant SCE response following exposure to any of the samples tested. Although there is no way of assessing changes which may have occurred during the first 4 months of storage, these liquid samples do not appear to change over time, at least in reference to their direct-acting capacities. Yet the timing of testing relative to sample collection may be critical to other samples. Therefore more recently received liquid samples (2279, 2278) were tested as soon as was possible after delivery. Additional testing of 2278, done at various times after the initial assay, demonstrates the repeatability over time of our direct acting assay system. The success of the S-9 activation dependent assay has been limited to the 1981-82 period. Therefore it is impossible to assess changes in the activation/detoxification-dependent activities of the samples over time. It has also been noted that the activities of the S-9 preparations vary between experiments. This variation may be due to insufficient Araclor induction of liver enzymes in the S-9 fractions, differences in co-factor preparations or inconsistencies in the CHO cell system. Also the high potency of the S-9 mix with cyclophosphamide in contrast to the limited SCE responses of the samples and S-9 mix could be due to differences in metabolism. Since the activation of cyclophosphamide proceeds through hydroxylation and the slurry samples received are largely hydrocarbons (38% coal), one would not expect them to be metabolized in the same manner. In addition, the limited SCE response to samples may be a function of the type of DNA damage induced and the repair capabilities of the CHO cells. It is conceivable that a different test system, i.e. human lymphocyte culture, could aid in elucidating the genotoxic potential of coal processing wastes.

1536 (DOE/PC/30337—T1, pp 41-58) **Mutagenicity of SRC-II coal liquefaction wastewater treatment residues.** Keleti, G.; Bern, J.; Shapiro, M.A.; Gulledge, W.P.; Moore, G.T. (Univ. of Pittsburgh, PA). 1982. NTIS, PC A04/MF A01.

In Mutagenicity testing for RCRA of residuals produced in the conversion of coal. Final report.

A first screen bioassay of an SRC-II coal liquefaction residual and three sludges resulting from treatment of the wastewater from the process was conducted using the Salmonella/microsome (Ames Test) method for detecting mutagenic activity. All of the residuals exhibited some mutagenicity, with those labeled as vacuum bottoms having 700 times greater specific mutagenic activity (revertants/mg) than fresh clarifier sludge and 5600 times greater than aged digester sludge in the first sample set. Organic fractions of each of the tested materials, produced by increasingly polar solvent extraction, were also measured for mutagenicity. The toluene and hexane fractions of clarifier sludge a.. ompared to digested sludge, which contains the bulk of the polycyclic aromatic hydrocarbons, showed little or no reduction in mutagenic activity. The other organic extract fractions showed great reduction in activity and in some cases complete elimination of the mutagenic fractions when the sludge has been digested.

1537 **(DOE/PC/40786—4) Heterogeneous kinetics of coal gasification. Quarterly technical progress report, 1 May 1982-31 July 1982.** Calo, J.M. (Brown Univ., Providence, RI (USA). Div. of Engineering). Aug 1982. Contract FG22-81PC40786. 54p. NTIS, PC A04/MF A01. Order Number DE83000807.

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During the reporting period significant progress was made on two fronts: (1) the steam addition system for transient steam-char kinetic experiments; and (2) the automated data acquisition system for rapid mass programming (control) of the mass spectrometer and data logging. Steam Addition System: Although it is a relatively straightforward matter to produce steam for the reactor, we found that it is quite a challenge to develop a system capable of maintaining a steady and accurately-known flow rate of steam-argon mixtures at high pressure and temperature in alternate flow circuits (i.e., the reactor and purge lines), while simultaneously protecting downstream valving and instrumentation. Thus, the scheme originally proposed has been modified to eliminate potential operating problems associated with the preliminary design. Automated Data Acquisition System: Although the CO_2 gasification data were obtained manually, the ultimate objective of the project to develop a quantitative understanding of the complete gasification rate process in the complex synthesis gas milieux calls for automated programming (control) of the mass spectrometer. In addition, the current mass spectrometer signal processing technique requires the use of a lock-in amplifier to extract the modulated portion of the total signal due to the beam species only, in an analog mode. In order to allow fast scanning of a number of species, the characteristic dwell time required by the lock-in amplifier on a particular mass peak must be decreased. These requirements are being met by implementing automated mass programming and data collection, and direct digital, phase-sensitive pulse counting.

1538 **(DOE/PC/40796—3) Carbon attrition during the fluidized combustion and gasification of coal. Quarterly technical progress report, 1 March-31 May 1982.** Massimilla, L.; Cammarota, A.; Chirone, R.; D'Amore, M. (Naples Univ. (Italy)). 1982. Contract FG22-81PC40796. 18p. NTIS, PC A02/MF A01. Order Number DE83001047.

The work during the period 1 March-31 May 1982 has been mainly directed to exploring the effect of oxygen concentration on the instantaneous rates of generation of carbon fines by attrition during the fluidized combustion of batches of 4760-6350 μm South African coal. Time-resolved bed carbon particle size distributions are determined under the same conditions as attrition experiments have been carried out. Instantaneous attrition rates have been correlated to bed carbon loading and exposed surface for various oxidizing conditions.

1539 **(DOE/PC/40797—4) Study of multiphase flow useful to understanding scaleup of coal liquefaction reactors. Technical progress report, June 1, 1982 to August 31, 1982.** Knickle, H.N. (Rhode Island Univ., Kingston (USA). Dept. of Chemical Engineering). Sep 1982. Contract FG22-81PC40797. 23p. NTIS, PC A02/MF A01. Order Number DE83000795.

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The 13 inch acrylic column has been assembled. Tests using 20 different porous plates were performed on the six inch column, using air and water. Two non-Newtonian fluid have been selected for initial experiments. These pseudoplastic fluids will be a solution of carboxymethylcellulose and water and a solution of polyethylene oxide and water. A preliminary literature review of measurements with these solutions has been made. Properties to define these solutions including apparent viscosity, surface tension, and density have been identified and techniques to measure these properties are being evaluated.

1540 **(DOE/PC/41035—4) Liquefaction of bituminous coals using disposable ore catalysts and hydrogen. Final report, February 7, 1982-July 31, 1982.** Mathur, V.K. (New Hampshire Univ., Durham (USA). Dept. of Chemical Engineering). Sep 1982. Contract AC22-81PC41035. 38p. NTIS, PC A03/MF A01. Order Number DE83000581.

There are a number of problems associated with the production of liquid fuels from coal. The most complex is the use of commercial catalysts which are expensive, with short life, and cannot be recovered or regenerated. The objective of this study was to conduct experiments on coal hydrogenation using low cost mineral ores as disposable catalysts. Coal samples from Blacksville Mine, Pittsburgh Bed were hydrogenated using a number of ores, ore concentrates and industrial waste products as catalysts. Experiments were also conducted using a commercial catalyst (Harshaw Chemicals, 0402T) and no catalyst at all to compare the results. Since iron pyrite has been reported to be a good disposable catalyst, experi-

ments were also conducted using pyrite individually as well as in admixture with other ores or concentrates. The liquefaction was conducted at 425°C under 2000 psig (13,790 kPa) hydrogen pressure for a reaction time of 30 minutes using SRC-II heavy distillate as a vehicle oil. The conclusions of this study are as follows: (a) Results of liquefaction using two cycle technique showed that the catalytic activity of iron pyrite could be enhanced by adding materials like limonite, laterite or red mud. Iron pyrite in admixture with limonite ore or molybdenum oxide concentrate gave the best results among all the binary mixtures studied. (b) Iron pyrite with molybdenum oxide concentrate and cobaltic hydroxide cake (metal loading in each case the same as in Harshaw catalyst) gave results which compared favorably with those obtained using the Harshaw catalyst. It is recommended that work on this project should be continued exploring other ores and their mixtures for their catalytic activity for coal liquefaction.

1541 **(DOE/RA/50404—1232-App.A-Vol.1) Technical data. Final technical report, November 1980-May 1982.** (WyCoalGas, Inc., Douglas, WY (USA)). 1982. Contract FC02-81RA50404. 401p. NTIS, PC A18/MF A01. Order Number DE83001049.

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1542 **(DOE/RA/50404—1232-App.D-Vol.3) Water supply and yield analysis. Final technical report, November 1980-May 1982.** (WyCoalGas, Inc., Douglas, WY (USA)). 1982. Contract FC02-81RA50404. 207p. NTIS, PC A10/MF A01. Order Number DE83001056.

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This volume contains the results of pumping tests on identified wells and water analysis results. No text. (LTN)

1543 **(DOE/RA/50404—1232-App.L) Quarterly audits of the air-quality monitoring station. Final technical report, November 1980-May 1982.** (WyCoalGas, Inc., Douglas, WY (USA)). Mar 1982. Contract FC02-81RA50404. 61p. NTIS, PC A04/MF A01. Order Number DE83001075.

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Four quarterly independent performance audits were conducted by Woodward-Clyde Consultants at the WyCoalGas, Inc. meteorology and air quality monitoring site located near Douglas, Wyoming. These audits were performed in accordance with Prevention of Significant Deterioration (PSD) air monitoring quality assurance requirements as promulgated by the US Environmental Protection Agency (EPA) in the Federal Register (40 CFR 58, Appendix B). The results, along with a brief discussion of the procedures used to conduct the audits are discussed in the following sections. Section 2.0 outlines the audit procedures used and Section 3.0 contains the audit results. Performance audits were conducted for sulfur dioxide (SO_3), oxides of nitrogen, (NO/sub x/), ozone (O_3), and total suspended particulate matter (TSP). Each continuous air monitoring system, which included the analyzer and both the data acquisition system (DAS) and the back-up strip chart recorder, was challenged with a zero level and four up-scale audit test concentrations.

1544 **(DOE/RA/50404—1232-App.P) WyCoalGas development feasibility study: site evaluations. Final technical report, November 1980-May 1982.** (Williams-Kuebelbeck and Associates, Inc., Marina Del Rey, CA (USA)). Oct 1981. Contract FC02-81RA50404. 107p. NTIS, PC A06/MF A01. Order Number DE83001082.

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The report provides a preliminary assessment of the land development opportunities available to WyCoalGas, Inc. which arise as a consequence of the construction of its proposed Coal Gasification Facility near Douglas, Wyoming. Present thinking indicates that the facility's construction labor force will peak at approximately 3400 workers and permanent work force at approximately 1000 workers, an influx of personnel which will generate significant demands for housing and related support services within Converse County. As part of the permitting process a number of studies are being prepared which identify the environmental and socioeconomic impacts likely to occur as a consequence of the development. The purpose of the following analysis is to recognize that these probable impacts - and the steps necessary to mitigate them - constitute important real estate investment opportunities for WyCoalGas, Inc. In effect, the successful planning and management of these forces represents, at a minimum, the possibility for reduction of total investment costs for the facility; at a maximum, the opportunity for the generation of significant profits from a well-conceived land development program. Several sites are considered from the point of view of planning, ease of development, acquisition possibilities, etc.

1545 **(DOE/RA/50404—1232-App.Q.Vol.6) Preliminary draft environmental impact statement. Final technical report, November 1980-May 1982.** (WyCoalGas, Inc., Douglas, WY (USA)). Aug 1981. Contract FC02-81RA50404. 224p. NTIS (US Sales Only). Order Number DE83001088.

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This volume contains data on baseline ecology and on environmental effects without the plant and as estimated with the plant and from traffic associated with the plant. A special section is devoted to streams. (LTN)

1546 **(DOE/SF/01484—T4) Concepts of fundamental processes related to gasification of coal. Quarterly progress report, July-September 1981.** Wiser, W.H. (Utah Univ., Salt Lake City (USA). Dept. of Mining and Fuels Engineering). Dec 1981. Contract AM03-77SF01484. 12p. (FE—1484-8). NTIS, PC A02/MF A01. Order Number DE82007119.

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The research projects are described: (1) single stage catalytic coal gasification is an attractive concept as a direct method of producing high BTU gas from coal. This process involves the introduction of a coal-solvent slurry and hydrogen gas into a fixed bed catalytic reactor, which employs a catalyst high in hydrogenation and cracking activity. Steam may also be added to the system. The gas produced will be principally methane. Thermodynamic calculations indicate that this process is essentially autothermal. Since this process utilizes the heat of methanation to a maximum extent, significant overall energy savings can be achieved over the more conventional multi-stage gasification systems. The primary objective of this research is to optimize the process variables to maximize methane yields. Initially, a sulfided Ni-W/SiO_2-Al_2O_3 catalyst will be used; (2) the demand for molecular hydrogen and for synthesis gas is rapidly increasing. Therefore, an extensive program on steam reforming of aromatic compounds such as benzene, substituted benzenes, naphthalene and other aromatics found in coal and coal-derived liquids (CDL) is being carried out. The combination of coal liquefaction-steam reforming of CDL could prove to be an important alternative to coal gasification for the production of SNG and hydrogen. An objective of this project is to assess the feasibility of this alternative. Potentially, coal liquids could be reformed directly in a single step to high BTU gas.

1547 **(ESG-DOE—13384) Partial liquefaction of coal by flash hydropyrolysis. Final technical report.** Oberg, C.L.; Falk, A.Y.; Kahn, D.R.; Combs, L.P. (Rockwell International Corp., Canoga Park, CA (USA). Energy Systems Group). 20 Sep 1982. Contract AC22-76ET10144. 222p. (FE—2044-52). NTIS, PC A10/MF A01. Order Number DE83001145.

Portions of document are illegible.

This report summarizes 4-2/3 years of work at Rockwell International for the US Department of Energy on research and development for partial liquefaction of coal by flash hydropyrolysis in an entrained-flow, short-residence-time reactor system. The program comprised three distinct phases of work. In Phase I, a reliable method for feeding pulverized coal to the reactor in dense phase was developed, and the mixing behavior of candidate injectors was investigated. Phase II was reactor development testing, first at a coal feed rate of 1/4 ton/h and later at 1 ton/h. Coal conversions and liquid hydrocarbon recoveries were sufficiently promising that the 1-ton/h reactor development facility was upgraded to a PDU in Phase III. Routine reactor operation with caking western Kentucky bituminous coals was established. Overall carbon conversions typically were in the 55 to 65% range. Carbon conversion to liquid hydrocarbons ranged between 30 and 40%, typically, with as much as 11% carbon conversion to BTX aromatics. Good progress was

made toward characterizing the quality and properties of the liquid product. Most of the remaining converted carbon was high-value gases (e.g., CH_4, CO, C_2H_4, C_6H_6) useful as pipeline SNG and chemical plant feed stocks. The unconverted carbon was collected as a fine granular dry char suitable for direct feeding to a partial-oxidation coal/char gasifier for hydrogen production. The commercial potential of flash hydroliquefaction was assessed by Scietific Design Company, Inc., as part of Phase III. Based on a grass-roots, mine-mouth plant producing an energy equivalent of 100,000 bbl/day of crude oil, they estimated 74% potential overall thermal efficiency and an average product selling price lower than those estimated for several competing coal liquefaction processes.

1548 **(MTI/WDC—82-TR-517) Laboratory testing of high-temperature coal-slurry-pump packings. Interim technical report No. 3.** Hao, B.R. (Mechanical Technology, Inc., Latham, NY (USA)). Sep 1982. Contract AC22-81PC40090. 109p. NTIS, PC A06/MF A01. Order Number DE83002128.

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This interim report presents the results of laboratory testing of selected packing designs and materials for coal liquefaction slurry feed pumps. The work was conducted as Task 3 of a high temperature packing test program (DOE Contract DE-AC22-81PC40090). The objective of the task is to test and to evaluate the packing candidates identified in Task 2 of the subject test program. Two types of packing tests were conducted in the laboratory; namely, static solvent compatibility tests and dynamic wear tests. In the static compatibility tests, the packings were immersed in different coal-derived solvents at 300°F for 96 hours. Changes in physical properties which included weight, dimension, deformation (under axial loading), and resiliency (after the removal of the axial loading) were measured and analyzed. Details on the test system design, procedures, and data analysis are presented. In the dynamic wear tests, the packings were tested in a modified commercial reciprocating plunger pump with different coal-derived solvents as working fluids. The modification permitted the packings to be tested in a commercial stuffing box design configuration at high fluid temperatures and constant fluid pressure. Performance of the packings in terms of installation requirement, adjustment, and fluid leakage were monitored and analyzed. Details of the test system design, test conditions, and data anlaysis are presented. The Department of Energy directed this test program with the objective of initiating engineering efforts to overcome the packing problems experienced at coal liquefaction pilot plants. The results and conclusions of this program are not endorsement of any commercial packing design and/or material. Instead, the output of the program is intended to promote better understanding and communication of the existing technical information for future technology development.

1549 **(NP—2904712) Hard coal pyrolysis at pressures between 1 and 100 bar.** Pottgiesser, C. (Technische Hochschule Aachen (Germany, F.R.). Mathematisch-Naturwissenschaftliche Fakultaet). 1980. 125p. (In German). NTIS (US Sales Only), PC A06/MF A01. Order Number DE82904712.

Thesis.

The process of pyrolysis is investigated with particular regard to the influence of pressure. Using a differential reactor, the release of gases and condensable products will be followed and the resulting tar and coke characterized. Experiments on pyrolysis in an inert gas steam and hydrogen atmosphere and with fast heat-up are described. The reaction kinetics of the coal pyrolysis process is discussed.

1550 **(ORNL/MIT—355) Low-temperature pyrolysis of coal to produce diesel-fuel blends.** Shafer, T.B.; Jett, O.J.; Wu, J.S. (Massachusetts Inst. of Tech., Oak Ridge, TN (USA). School of Chemical Engineering Practice). Oct 1982. Contract W-7405-ENG-26. 58p. NTIS, PC A04/MF A01. Order Number DE83001637.

Low-temperature (623 to 773°K) coal pyrolysis was investigated in a bench-scale retort. Factorially designed experiments were conducted to determine the effects of temperature, coal-particle size, and nitrogen flow rate on the yield of liquid products. Yield of condensable organic products relative to the proximate coal volatile matter increased by 3.1 and 6.4 wt % after increasing nitrogen purge flow rate from 0.465 to 1.68 L/min and retort temperature from 623 to 723°K, respectively. The liquid product may be suitable for blending with diesel fuel. The viscosity and density of coal liquids produced at 723°K were compared with those of diesel fuel. The coal liquids had a higher carbon-to-hydrogen ratio and a lower aliphatic-to-aromatic ratio than premium quality No. 2 diesel fuel. It was recommended that liquids from coal pyrolysis be blended with diesel fuel to determine stability of the mixture and performance of the blend in internal combustion engines.

1551 **(ORNL/MIT—359) Critical flow of nitrogen and water through a nozzle.** Stalzer, E.H.; Richards, A.D. (Massachusetts Inst. of Tech., Oak Ridge, TN (USA). School of Chemical Engineering Practice). Oct 1982. Contract W-7405-ENG-26. 61p. NTIS, PC A04/MF A01. Order Number DE83001699.

Critical flow of nitrogen-water mixtures through a nozzle positioned in a vertical pipe with upward flow was studied. The flow rates of nitrogen and water were from 7.37×10^{-3} to 10.84×10^{-3} m^3/s at STP (15.6 to 22.2 scfm) and 0.355×10^{-3} to 0.505×10^{-3} m^3/s (5.63 to 8.01 gpm), respectively. A 0.49-cm (0.93 in.) exit-diameter, stainless-steel nozzle was fitted inside a stainless-steel pipe 1.516 cm (0.597 in.) in ID. The upstream critical pressure increased with increasing flow rates of nitrogen and water. An iterative empirical correlation was developed to predict upstream and vena contracta critical pressures for given nitrogen and water flow rates, temperature, and nozzle area. Upper and lower bounds for the upstream critical pressure were predicted theoretically. The upper bound, derived assuming homogeneous equilibrium flow, overpredicted the experimental value at each run by 0.31 +- 0.04 MPa (45 +- 5.8 psia). 14 figures, 9 tables.

1552 **(PNL—4230) Health and environmental effects document for direct coal liquefaction - 1981.** Mellinger, P.J.; Wilson, B.W.; Mahlum, D.D.; Sever, L.E.; Olsen, A.R. (Pacific Northwest Lab., Richland, WA (USA)). Sep 1982. Contract AC06-76RL01830. 52p. NTIS, PC A04/MF A01. Order Number DE83000941.

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This document presents initial estimates of potential human health effects from inhalation of nonmethane hydrocarbons (NMHC) that may be released from a future hypothetical industry producing about 600,000 bbl/day of synthetic fuel by direct liquefaction of coal. The assessment approach starts wth general assumptions that are then refined in a tiered sequence that considers available epidemiological, environmental and chemical data. The uncertainties involved in such an evaluation have been quantified where possible at this early stage of health risk analysis. Many surrogate data bases were considered for application to coal liquefaction including coke oven, British gas retort, roofing tar and asphalts, and cigarette smoke. The coke oven data base was selected for this assessment because the chemical and physical nature of coke oven emissions are judged to more closely approximate potential coal liquefaction emissions. Utilizing the extensive epidemiological data base for coke oven workers as a surrogate model, health effects from release of coal liquefaction NMHC may be quantified. This method results in estimates of about 1×10^{-3} excess cancer deaths/yr to an industrial work force of 7800 persons and 5×10^{-3} excess cancer deaths/yr in the U.S. population as a whole from NMHC that boil above 600°F. Sources of uncertainty in the estimates are listed. Using these uncertainties, it is estimated that from 2×10^{-4} to 5×10^{-3} lung cancer deaths/yr may occur in the industrial work force and from 1×10^{-2} to 2.5×10^{-1} lung cancer deaths/yr in the U.S. population as a whole. On an individual basis, the excess lifetime risk to occupationally exposed workers is estimated to be 500 times greater than to members of the U.S. public.

1553 **(SAND—82-1924) Coal-liquefaction-process research quarterly report, January 1 - March 31, 1982.** Johnston, K.P.; Linn, J.K.; Lynch, A.W.; Stephens, H.P.; Stohl, F.V.; Thomas, M.G. (Sandia National Labs., Albuquerque, NM (USA)). Oct 1982. Contract AC04-76DP00789. 58p. NTIS, PC A04/MF A01. Order Number DE83002135.

Portions of document are illegible.

Objectives of the program are to understand the mechanisms of coal liquefaction, to determine the role of catalysts in the direct

conversion of coal to liquids, to determine the mechanism of catalyst deactivation and to explore slurry phase catalyst systems. Specific projects include: short-contact time coal liquefaction, mineral matter effects and catalyst studies. During this period, work was performed on: (1) the stability, at reaction temperature, of a recycle solvent obtained from the Lummus Two Stage Liquefaction facility, (2) reactions of preasphaltenes and asphaltenes prepared under various reaction severities, (3) the evaluation of the catalyst level detector installed at the H-Coal facility, (4) the characterization of oil soluble metal compounds with respect to hydrogenation activity, and (5) characterization, deactivation and regeneration of catalysts obtained from both the H-Coal and Lummus facilities.

1554 **Slurry atomizer for a coal-feeder and dryer used to provide coal at gasifier pressure.** Friggens, G.R.; Loth, J.L.; Smith, W.C. (to Department Of Energy). US Patent 4,341,530. 27 Jul 1982. Filed date 23 Jun 1981. vp.

PAT-APPL-276610.

The present invention is directed to a coal-water slurry atomizer for use in a high-pressure dryer employed in a pumping system utilized to feed coal into a pressurized coal gasifier. The slurry atomizer is provided with a venturi, constant area slurry injection conduit, and a plurality of tangentially disposed steam injection ports. Superheated steam is injected into the atomizer through these ports to provide a vortical flow of the steam, which, in turn, shears slurry emerging from the slurry injection conduit. The droplets of slurry are rapidly dispersed in the dryer through the venturi where the water is vaporized from the slurry by the steam prior to deleterious heating of the coal.

1555 **(PB—82-211384) New heterogeneous catalysts for coal hydrogenation.** Weiss, A. (Muenchen Univ. (Germany, F.R.). Inst. fuer Anorganische Chemie). May 1982. Translation source information not available . 92p. NTIS, PC A05/ MF A01.

In the first part of the present study the author investigated the possibility for improving hydrogenation of coal by a pretreatment and compounds, which react to intercalation complexes with graphite. The increased surface area, accessible after this pretreatment, has a drastic effect, which however is overcompensated by the large amount of chemicals, needed in the procedure. In the second part layered disulfides, capable of forming intercalation complexes have been tested as catalysts for coal hydrogenation. Several of these render coal (Ruhr II) pyridine soluble up to 85-87%, when applied in amounts of 0,07% only at 380 degrees C and a hydrogen pressure of 10 bars. Layered sulfides are most effective, in case they can be disintegrated into colloidal solutions with individual MS2-layers via intercalation. Among these, sulfides in the systems (Mo, Cr)S2, (Ti,Sn)S2, Nax(Co,Nb)S2,Nax(Ni,Nb)S2Nax(Co),(Cu,Nb)S2,Nax(Co,V)S2 and (H2O)xCrS2 are most effective. Deviation from ideal stoichiometry is very important.

1556 **Role of silicon additions in the corrosion resistance of chromia-forming alloys in coal gasification atmospheres.** Nagarajan, V.; Miner, R.G.; Levy, A.V. (Lawrence Berkeley Lab, CA, USA). *Journal of the Electrochemical Society;* **129**: No. 4, 782-788(Apr 1982).

The use of silicon in Fe-18% Cr alloys was investigated to determine whether the poor sulfidation resistance of 18% Cr iron-base alloys for use in reducing coal gasification system atmospheres could be improved. It was determined that up to 2% Si did not produce an SiO_2 layer, but rather occurred in isolated areas in the corrosion scale and internally in the base metal. The 18% Cr also did not produce a continuous protective scale, permitting rapid corrosion to occur within 100 hr of exposure to P/sub O2/ ?10^{-18} atm, P/sub S2/ .10^{-6} atm gases at 982°C. 7 refs.

1557 **Role of chromium in the corrosion resistance of alumina-forming alloys in coal gasification atmospheres.** Nagarajan, V.; Miner, R.G.; Levy, A.V. (Lawrence Berkeley Lab, CA, USA). *Journal of the Electrochemical Society;* **129**: No. 4, 789-795(Apr 1982).

A series of six iron-base alloys containing different levels of Cr and Al have been exposed to a low P_{O2} (10^{-18} atm), high P/sub S2/ (10^{-6} atm) environment. The results indicate that the high Al-containing alloys have poor corrosion resistance. A critical Cr/Al ratio seems to be essential for good corrosion resistance. 7 refs.

1558 **Compatibility of water-cooled chromia-containing refractories with a high iron oxide acidic coal-ash slag at 1575°C.** Kennedy, C.R. (Argonne Natl Lab, IL, USA). *Journal of Materials for Energy Systems;* **3**: No. 3, 39-47(Dec 1981).

Sixteen water-cooled refractories were exposed to a synthetic high iron oxide acidic coal slag. The importance of high chromia content and density in minimizing corrosive attack was evident. The beneficial effect of water cooling was also demonstrated. All of the refractories reacted with the slag to form complex intermediate spinel layers with the general formula $(Fe,Mg)(Cr,Al)_2O_4$. Refractories high in chromia resist fluxing by iron oxide better than refractories high in alumina. 9 refs.

1559 **Control of corrosion in coal liquefaction plant fractionation columns.** Keiser, J.R.; Judkins, R.R.; Irvine, A.R.; Baylor, V.B. (Oak Ridge Natl Lab, TN, USA). *Journal of Materials for Energy Systems;* **3**: No. 3, 48-55(Dec 1981).

Severe corrosion has been encountered in fractionation columns at the solvent refined coal (SRC) pilot plants in Fort Lewis, Washington, and Wilsonville, Alabama, as well as at the H-Coal Pilot plant in Catlettsburg, Kentucky, and the Exxon Donor Solvent Pilot Plant in Baytown, Texas. Studies of this problem included exposure of coupons in the columns, analyses of liquids collected at the pilot plants, and laboratory experiments. This work specifies alloys with adequate corrosion resistance for construction of fractionation columns, identifies the chlorine-bearing compounds, and proposes chlorine transport and corrosion mechanisms. 14 refs.

1560 **(CONF-820217—8) Commercial readiness of the U-GAS Process.** Bush, J.R.; Patel, J.G. (Institute of Gas Technology, Chicago, IL (USA)). [nd]. 9p. Institute of Gas Technology, 3424 South State St., IIT Center, Chicago, IL 60616.

From 9. energy technology conference; Washington, DC, USA (16 Feb 1982).

The Institute of Gas Technology (IGT) has developed an advanced coal gasification process - the U-GAS Process - to commercial readiness. Confirmation of commercial readiness is now established through completion of a thorough, documented, process development test program, establishing a detailed commercial plant process design based on proven testing and operation, and a favorable evaluation of the process economics. The U-GAS process development program has shown economical handling of large gas volume throughput with high carbon conversion (over 98%) of coal to gas in an environmentally acceptable manner. A substantive data base exists for scale-up to commercial process designs. This data also demonstrate the process flexibility through documented results with coals ranging from subbituminous through highly caking bituminous. The U-GAS process, one of the most flexible, efficient, environmentally acceptable, and economical coal gasification technologies in the United States, is presently available for licensing through GDC, Inc., a wholly-owned subsidiary of IGT.

0105 By-products

1561 **(Juel-Spez—91) ADAM I-experiments for optimization of methanation in the system 'long distance nuclear energy system' - test run spring 1980.** Hoehlein, B.; Menzer, R.; Vorwerk, M.; Skov, A. (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Inst. fuer Reaktorbauelemente). Oct 1980. 38p. (In German). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82750583.

The partners of the NFE project (Nukleare Fernenergie) - Kernforschungsanlage Juelich GmbH und Rheinische Braunkohlenwerke AG - have investigated various problems of the methanation of synthesis gas in order to improve the Long Distance Nuclear Energy System . In a test run with the pilot plant ADAM I - February 1980 - the partners of the NFE project, in collaboration with Haldor Topsoe A/S, could obtain important results with regard to the high temperature methanation up to 700°C, to a closed steam reforming-methanation circuit and to the operation of a recycle

ejector in ADAM I to limit the outlet temperature of the first reactor.

1562 **(NP—2904730) Ensuring raw materials by coal enrichment.** (Verband der Chemischen Industrie e.V., Frankfurt am Main (Germany, F.R.)). 1981. vp. (In German). NTIS (US Sales Only), PC A04/MF A01. Order Number DE82904730.

This is a report on the activities of the Working Group on Coal Beneficiation founded in April 1974 by Verband der Chemischen Industrie e.V., or rather the activities of the undertakings cooperating in this working group. Initiated by the oil crisis of late 1973, stock was taken to begin with of the possibilities of substituting petrochemical primary chemicals by chemicals produced in coal beneficiation processes. The results were published in the study Rohstoffsicherung durch Kohleveredelung (ensuring raw materials by coal beneficiation). Work in this field has gained new impetus from continued research and especially from the 1978/79 surge of oil prices. The present brochure reviews the state of the art achieved by now; it is found that the basic arguments of the older study are still absolutely valid today.

0106 Properties

REFER ALSO TO CITATION(S) 1525, 1533, 1597, 1626, 2668

1563 **(CONF-820861—2) Chemical analysis of coal by energy dispersive x-ray fluorescence utilizing artificial standards.** Wheeler, B.D. (EG and G ORTEC, Oak Ridge, TN (USA)). 1982. 10p. EG and G ORTEC, 100 Midland Rd. Oak Ridge, TN 37830.

From 31. annual Denver X-ray conference; Denver, CO, USA (3 Aug 1982).

Portions of document are illegible.

Accurate determinations of the elemental composition of coal by classical methods can be quite difficult and are normally very time consuming. X-ray fluorescence utilizing the powder method, however, has the ability of providing accurate and rapid analyses. Unfortunately, well characterized standards, although available, are not plentiful. In addition, the durability of stability of ground and pelletized coal samples is poor resulting in deterioration with time. As a result, artificial coal standards were prepared from certified geological materials by fusing in lithium tetraborate in percentages approximating expected ash contents and compositions in coal. Since the lithium tetraborate comprises about the same percentage of the standard as does the carbon, hydrogen, and oxygen in coal, the ground and pelletized coal sample can be assayed against the fused calibration curves by compensating for the differences in the mass absorption coefficients of the two matrices. 5 figures, 4 tables.

1564 **(DOE/ER/01198—1392) Transmission electron microscopy (TEM) study of minerals in coal.** Hsieh, K.C. (Illinois Univ., Urbana (USA). Dept. of Metallurgy and Mining Engineering). 1982. Contract AC02-76ER01198. 146p. NTIS, PC A07/MF A01. Order Number DE83001041.

Thesis. Portions of document are illegible.

Minerals in eight coals from different mines were characterized in the micron-size range by using analytical transmission electron microscopy. Specimens were thinned by ion-milling wafers cut from these coals; a cold stage cooled by liquid nitrogen was used to reduce thermal degradation of the minerals by the ion-beam. Different mineral compounds were observed in different coals. The major minerals are clays, sulfides, oxides, carbonates and some minor-element-bearing phosphates. Clays (kaolinite, illite and others) have been most commonly found as either flat sheets or round globules. Iron sulfide was mostly found in the No. 5 and No. 6 coals from Illinois, distributed as massive polycrystals, as clusters of single crystals (framboids) or as isolated single crystals with size range down to some 0.25 microns. Other sulfides and some oxides were found in other coals with particle size as small as some 200 angstroms. Quartz, titanium oxides and many other carbonates and phosphate compounds were also characterized. Brief TEM work in the organic mass of coal was also introduced to study the nature of the coal macerals.

1565 **(DOE/MC/14718—1213) Magnetic components and particle-size distribution of coal fly ash.** Chaddha, G.; Seehra, M.S. (West Virginia Univ., Morgantown (USA). Dept. of Physics). 1982. Contract AT21-80MC14718. 22p. NTIS, PC A02/MF A01. Order Number DE83000576.

Coal fly ash samples are known to contain magnetic components. In this work we report the results of a first detailed study in which the nature and concentrations of the magnetic components have been measured as a function of particle size. Five bituminous coal fly ash samples were size-fractioned with sieves and a sieve shaker into 10 fractions each. Using temperature-dependent magnetic measurements and powder x-ray diffraction studies, it is established that the samples contain magnetite (Fe_3O_4) and haematite (α-Fe_2O_3). About half the mass and magnetic components are contained in the fraction with the smallest particles (diameter < 38 μm). Since the magnetization M for α-Fe_2O_3 (at 7 kOe) $\simeq 1/250$ (the saturation magnetization M/sub s/ for Fe_3O_4), it follows that the measured M/sub s/ is mainly due to Fe_3O_4. The variation of M/sub s/ with particle size then simply reflects the relative abundance of Fe_3O_4 in various fractions. A correlation between all the observations is established, thus, providing useful information about the combustion conditions of fly ash. Possible applications of these results are outlined.

1566 **(NP—2904717) Flow characteristics of coal-oil mixtures, especially when blown into a blast furnace.** Kreusing, H. (Technische Hochschule Aachen (Germany, F.R.). Fakultaet fuer Bergbau und Huettenwesen). 20 Aug 1979. 103p. (In German). NTIS (US Sales Only), PC A06/MF A01. Order Number DE82904717.

Thesis.

Partial substitution of blast furnace oil by a coal-oil mixture is considered feasible on a short-term or medium-term basis as this mixture has some advantages over coal dust, and conversion problems should be minimal. The author intends to facilitate this judgment of feasibility by compiling as much information as possible in preliminary investigations, independent of blast furnace applications. Exact knowledge is required of flow characteristics dependent of coal and oil quality, solids concentrations, temperature, grain size, etc.

1567 **(PB—82-193624) The evaluation of the Nippon Steel Corporation reactivity and post-reaction-strength test for coke.** (British Carbonization Research Association, Chesterfield). Dec 1980. 54p. NTIS, PC A04/MF A01.

A systematic investigation was made of the factors influencing the reactivity of coke, including test temperature, coke structural properties, mineral inclusions and additives, and the inert content of the charge.

0108 Waste Management

REFER ALSO TO CITATION(S) 1590, 2070, 2071, 2081

1568 **(ANL/EES-TM—191) Identification of data gaps and research needs for solid wastes from synfuel technologies.** Fradkin, L.; Streets, D.G. (Argonne National Lab., IL (USA)). Mar 1982. Contract W-31-109-ENG-38. 45p. NTIS, PC A03/MF A01. Order Number DE83000936.

This report presents an overview of research activity currently being funded by the US Department of Energy (DOE) on solid wastes from coal gasification, coal liquefaction, and oil shale technologies, Projects conducted in the DOE energy technology centers and national laboratories, and in cooperative projects with other government agencies, private industry, and universities are developing the basic and applied technology and data on which present and future fuel-conversion and utilization processes depend. The report identifies data gaps and recommends research needs where warranted.

1569 **(BMFT-FB-T—82-026) Flue gas desulfurization with waste water evaporation: Phase II.** Brauweiler, H.; Karger, R.; Starke, U. (Bundesministerium fuer Forschung und Technologie, Bonn (Germany, F.R.)). Mar 1982. 20p. (In German). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82750549.

The R+D project was undertaken with the aim to test a process for cleaning flue gases with high chloride content from coal-fired power plants, gases which are expected in the near future in the Ruhrarea. One study, sponsored by the Federal Ministry of Research and Technology and conducted by STEAG, dealing with a comparison of processes, Project No. 1054 Z Reduction of sulfur dioxide emission, choice of flue gas desulfurization process, indicated that the SHU process has a certain potential especially with regard to reducing the amount of waste water. The anticipated advantage has to be proven by pilot-scale testing followed by industrial-scale trial. The results of the R+D project have shown that operating with 25% per weight of $CaCl_2$ is feasible with regard to desulfurization and oxidation. The appreciable lowering of waste water is, however, only possible - as indicated by the investigations up to now - when the quality requirement of gypsum with respect to the Cl -content is decreased.

1570 **(DOE/ET/10159—T23) Technical analysis of advanced wastewater-treatment systems for coal-gasification plants.** (UOP/SDC, Joint Venture, McLean, VA (USA)). 31 Mar 1981. Contract AC01-78ET10159. 188p. NTIS, PC A09/MF A01. Order Number DE83000821.

This analysis of advanced wastewater treatment systems for coal gasification plants highlights the three coal gasification demonstration plants proposed by the US Department of Energy: The Memphis Light, Gas and Water Division Industrial Fuel Gas Demonstration Plant, the Illinois Coal Gasification Group Pipeline Gas Demonstration Plant, and the CONOCO Pipeline Gas Demonstration Plant. Technical risks exist for coal gasification wastewater treatment systems, in general, and for the three DOE demonstration plants (as designed), in particular, because of key data gaps. The quantities and compositions of coal gasification wastewaters are not well known; the treatability of coal gasification wastewaters by various technologies has not been adequately studied; the dynamic interactions of sequential wastewater treatment processes and upstream wastewater sources has not been tested at demonstration scale. This report identifies key data gaps and recommends that demonstration-size and commercial-size plants be used for coal gasification wastewater treatment data base development. While certain advanced treatment technologies can benefit from additional bench-scale studies, bench-scale and pilot plant scale operations are not representative of commercial-size facility operation. It is recommended that coal gasification demonstration plants, and other commercial-size facilities that generate similar wastewaters, be used to test advanced wastewater treatment technologies during operation by using sidestreams or collected wastewater samples in addition to the plant's own primary treatment system. Advanced wastewater treatment processes are needed to degrade refractory organics and to concentrate and remove dissolved solids to allow for wastewater reuse. Further study of reverse osmosis, evaporation, electrodialysis, ozonation, activated carbon, and ultrafiltration should take place at bench-scale.

1571 **(DOE/FC/10297—T3) Anaerobic treatment of gasifier effluents. Quarterly report No. 4.** Cross, W.H.; Chian, E.S.K.; Pohland, F.G.; Giabbai, M.; Harper, S.R.; Kharkar, S.; Cheng, S.S.; Shuey, P.S.; Lu, F. (Georgia Inst. of Tech., Atlanta (USA)). Jul 1982. Contract AC18-81FC10297. 34p. NTIS, PC A03/MF A01. Order Number DE82018230.

Portions of document are illegible.

Systems I and II have been operated since the last quarterly report for an additional period of 91 days (day 175-266). They received identical feed substrates of diluted wastewater and phosphates. The concentration of the wastewater was ~ 10% (1000 ppM TOC) for a period of 20 days (day 175-195). On day 196 of operation the concentration of raw wastewater in the influent was increased to ~ 15% (1500 ppM TOC) and the system was operated for an additional 40 days (day 126-236). During this latter period performance of both Systems I and II decreased markedly. In order to improve the efficiency of the system performance $FeCl_3$ was added to the feed substrate on day 209 to either precipitate, in the case of S^{-2}, or complex in the case of CN^- and SCN^-, potentially inhibitory species. No improvement in operation was noted. Therefore on day 237 the influent raw wastewater concentration was reduced to ~ 10% (100 ppM TOC) and the systems were operated an additional 17 days under these conditions. Lack of biological activity as evidenced by extremely low TOC and COD removal coupled with a lack of gas production indicated the systems were either severely inhibited or had failed. Therefore, on day 254 both Systems I and II were drained, reseeded with sludge from a municipal anaerobic sludge digester and reacclimation of these two systems was initiated. Data obtained during the pseudo steady state operation of System I and II (day 147-195) is presented.

1572 **(DOE/PC/42682—T3) Field-simulation analysis for disposal of liquefaction solid waste. Third quarterly technical progress report.** (Dynamac Corp., Rockville, MD (USA). Enviro Control Div.). 27 Aug 1982. Contract AC22-81PC42682. 88p. NTIS, PC A05/MF A01. Order Number DE82020585.

The tasks to be performed in this study are: (1) review applicable RCRA documents; (2) select waste and site-related parameters of interest; (3) compare and recommend leachate test methods; (4) review predictive simulation models and select one or more for further development; (5) identify required field verification data; and (6) develop a field monitoring program to obtain these data. This report represents the third quarterly progress report and contains the text prepared to date under Task 4.

1573 **(EPRI-CS—2559) Landfill disposal of limestone dual-alkali flue-gas-desulfurization waste. Final report.** Fox, L.K.; Gibson, E.D.; Pierson, J.F.; Brown, D.M. (Little (Arthur D.), Inc., Cambridge, MA (USA)). Sep 1982. 283p. NTIS, PC A13/MF A01. Order Number DE83900146.

A landfill disposal test program was undertaken to demonstrate the addition of fly ash and lime to calcium sulfite-sulfate flue gas desulfurization (FGD) wastes and to establish design and operating guidelines for an environmentally acceptable waste disposal system. A lined, diked landfill disposal site was partially filled with waste mixtures of FGD filter cake, fly ash, and lime. Field samples were assessed in terms of engineering properties and leachate quality. Laboratory mixtures were analyzed for comparison with field samples. Revegetation studies were performed with laboratory mixtures to determine how fly ash and FGD sludge affect plant growth and to identify candidate species for on-site testing. Fixation and stabilization improved the shear strength and reduced the compressibility of the laboratory mixtures tested. Laboratory testing of the properties of fixed filter cake indicated that mixtures of filter cake with a solids content of 56%, a fly ash-to-filter cake ratio of 1:1, and a lime content of 3% have a natural water content below the liquid limit and appear to be suitable for landfill. Lime fixation also reduced steady-state leachate concentrations of major constituents (total solids, sulfate, and calcium) and may help to minimize trace metal concentrations. Grasses were identified as the preferred species for vegetating landfills.

1574 **(ORNL/TM—8408) Bench-scale treatment of coal-liquefaction-process wastewaters.** Bostick, W.D.; Jolley, R.L.; Hewitt, J.D.; Overton, J.B. (Oak Ridge National Lab., TN (USA)). Sep 1982. Contract W-7405-ENG-26. 50p. NTIS, PC A03/MF A01. Order Number DE83000468.

Coal conversion wastewaters present unusual control technology problems due to their high concentrations of certain toxic chemicals such as phenolics, ammonia, and sulfide ion. The most contaminated wastewater streams are the process condensates or sourwaters that have been in direct contact with organic species at high temperature during the conversion process. Treatment of these process condensates to meet present and projected discharge limits is thus a formidable challenge. The emphasis of this report is on the specific effects of the bench-scale treatment of a sample of process condensate from the H-Coal liquefaction process pilot plant located at Catlettsburg, Kentucky. The specific unit operations used in our study were: steam-stripping to remove ammonia and sulfide ion; solvent-extraction with methyl isobutyl ketone to remove phenolic compounds and neutral organics; and ozonation and carbon adsorp-

tion as polishing steps. Some of the advantages and limitations of these operations are reported. Objectives for this project included (1) evaluating, in detail, some of the process chemistries associated with wastewater treatment operations; (2) evaluating the toxicity phenomena associated with individual wastewater treatment processes and with the total treatment system; (3) supporting the development of designs for process units used in field tests of wastewater treatment operations; and (4) identifying research and development needs and opportunities for process improvements in the area of wastewater treatment.

1575 **(ORNL/TM—8495) Conceptual design, cost estimate, and R & D guidelines for a modular, transportable wastewater treatment pilot plant.** Brown, C.H. Jr.; Oswald, G.E. (Oak Ridge National Lab., TN (USA)). Sep 1982. Contract W-7405-ENG-26. 35p. NTIS, PC A03/MF A01. Order Number DE83001674.

A conceptual process flow diagram was developed for a modular, transportable wastewater treatment pilot plant which incorporates the following areas: feed pretreatment and storage, solvent extraction for phenol recovery, acid gas and ammonia stripping, biological treatment, and a cooling tower-heat exchange loop to study water reuse. This loop contains reverse osmosis (RO) and lime-soda softening as sidestream processes for removal of hardness and dissolved solids. The units can be operated in various sequences or singly as the treatment study demands. With the flowsheet as a basis, a cost estimate was made for construction of the modules at the Oak Ridge National Laboratory (ORNL). An estimated cost of $594,000 was determined for the purchase of major equipment, labor for construction, and miscellaneous equipment and instrumentation.

1576 **(PB—82-178674) Institutional barriers to increased utilization of power plant ash in Maryland: analysis and recommendations. Final report.** Hudson, J.F.; Stoler, M.; Demeter, C.; Farrell, S.O. (Urban Systems Research and Engineering, Inc., Cambridge, MA (USA)). Jan 1982. 118p. NTIS, PC A06/MF A01.

This report is directed at the problems of disposal and utilization of coal fired power plant solid wastes in Maryland. Each year, Maryland and D.C. power plants produce over 0.8 million tons of fly ash, bottom ash, and boiler slag (collectively, 'ash') and this quantity is expected to increase to 1.5 million tons by 1990. While only a small fraction of these wastes is presently used as a resource, increased utilization is possible, thus decreasing the quantities landfilled. Given the potential for increased use, a question is whether the state can aid utilities in finding markets for their solid wastes, so that use can be maximized and disposal minimized. For example, if existing state and local regulations present unreasonable barriers which delay use, or make use impractical or expensive, such barriers should be removed. Positive actions might also be taken to increase utilization of the ash resource. Based on surveys of eight states and detailed analysis of the Maryland situation, this report presents the existing institutional barriers to increased ash use in Maryland. 'Institutional barriers' as used in this report refer to legal, regulatory, and administrative activities of government agents which impact utilization efforts. Along with the list of barriers, this report includes a detailed survey of the regulatory treatment of ash and standards for highway construction use of ash. The report also provides comparisons with other states and presents a set of potential remedies for consideration.

1577 **(PB—82-178963) Computerized Shawnee lime/limestone scrubbing model users manual.** Anders, W.L.; Torstrick, R.L. (Tennessee Valley Authority, Muscle Shoals, AL (USA). Div. of Energy Demonstrations and Technology). Mar 1981. 193p. (TVA/OP/EDT—81/15). NTIS, PC A09/MF A01.

The manual gives a general description of a computerized model for estimating design and cost of lime or limestone scrubber systems for flue gas desulfurization (FGD). It supplements PB80-123037 by extending the number of scrubber options which can be evaluated. It includes spray tower and venturi/spray-tower absorbers, forced oxidation systems, systems with absorber loop additives (MgO or adipic acid), revised design and economic premises, and other changes reflecting process improvements and variations. It describes all inputs and outputs, along with detailed procedures for using the model and all its options. The model is based on prototype scrubber data from the EPA/Shawnee test facility and should be useful to utility companies, as well as to architectural and engineering contractors who are involved in selecting and designing FGD facilities. As key features, the model provides estimates of capital investment and operating revenue requirements. It also provides a material balance, equipment list, and a breakdown of costs by processing areas. The primary uses of the model are to project comparative economics of lime and limestone FGD processes and to evaluate system alternatives prior to the development of a detailed design.

1578 **(PB—82-192535) Economics of ash disposal at coal-fired power plants. Final report Aug 79-Mar 81.** Kennedy, F.M.; Schroeder, A.C.; Veitch, J.D. (Tennessee Valley Authority, Muscle Shoals, AL (USA). Div. of Energy Demonstrations and Technology). Oct 1981. 241p. NTIS, PC A11/MF A01.

The report gives results of an evaluation of the comparative economics of utility ash disposal by five conceptual design variations of ponding and landfill for a 500-MW power plant producing 5 million tons of ash over the life-of-project. For a basic pond disposal without water reuse, the total capital investment from hopper collection through 1-mile sluicing and pond disposal is $/52/kW (1982$). Comparable total system investment using trucking to a landfill is $/30/kW. (All disposal site construction costs were fully capitalized in in both cases; this convention affects the comparison of annual revenue requirements). First-year annual revenue requirements for the ponding system are 1.85 mills/kWh (1984$); those for the landfill system are lower (1.66 mills/kWh). On the other hand, levelized annual revenue requirements are 2.26 and 2.42 mills/kWh, respectively. Disposal site costs are the major element in all types of disposal and constituted the major difference in cost between pond and landfill disposal. Reuse of sluicing water and additional provisions for the disposal of self-hardening (high calcium oxide) ash added relatively little to costs.

1579 **(PB—82-192543) Evaluation of the advanced low-Nox burner, Exxon, and Hitachi Zosen DeNox processes. Final report Nov 79-Jun 81.** Maxwell, J.D.; Humphries, L.R. (Tennessee Valley Authority, Muscle Shoals, AL (USA). Div. of Energy Demonstrations and Technology). Jul 1981. 140p. NTIS, PC A07/MF A01.

The report is a technical discussion and preliminary economic evaluation of six NOx control methods: three at 50% NOx reduction, and three at 90%. The basecase power plant is a new 500-MW coal-fired unit emitting 0.6 lb NO2/million Btu in the flue gas. The three 50% NOx reduction processes are the EPA-sponsored advanced low-NOx burner (ALNB), the Exxon Thermal DeNOx process, and the Hitachi Zosen process, which have capital investments of $4.8, $19.7, and $31.4/kW, respectively, and levelized annual revenue requirements of 0.20, 1.9, and 4.7 mills/kWh, respectively. For 90% NOx reduction, the ALNB process is combined with the Hitachi Zosen process, the Exxon process is combined with the Hitachi Zosen process, and the Hitachi Zosen process is used alone. Capital investment and levelized annual revenue requirements for these three processes are $51.8/kW and 6.7 mills/kWh for the ALNB/Hitachi Zosen process, $64.2/kW and 8.2 mills/kWh for the Exxon/Hitachi Zosen process, and $50.9/kW and 7.9 mills/kWh for the Hitachi Zosen process alone. The ALNB, a combustion modification, is the least expensive NOx control method. As expected, the costs for obtaining high levels of NOx reduction (90%) are significantly greater than for more moderate levels (50%).

1580 **(PB—82-193053) A review of standards of performance for new stationary sources - coal preparation plants.** Bibb, T. (TRW Energy Systems Group, Redondo Beach, CA (USA)). Dec 1980. 91p. NTIS, PC A05/MF A01.

This study has reviewed and assessed the need to revise the new source performance standards (NSPS) for coal preparation plants. These standards limited particulate emissions or opacities from pneumatic coal cleaning equipment, coal dryers, coal processing and conveying, coal storage, and coal transfer and loading.

Control device performances have not changed to justify changing the particulate standards. Emissions of SO2 are too small to justify setting standards for this pollutant. EPA plans to investigate coal storage piles and unloading stations as unregulated sources of potential particulate fugitive emissions.

1581 **(PB—82-208273) Analytical methods for hazardous organics in liquid wastes from coal gasification and liquefaction processes. Report for Feb 79-Oct 80.** Yen, T.F.; Tang, J.I.S.; Wasburne, M.; Cohanim, S. (University of Southern California, Los Angeles (USA)). Apr 1982. 98p. NTIS, PC A05/MF A01.

This study was conducted by the University of Southern California group to provide methods for the analysis of coal liquefaction wastes from coal conversion processing plants. Several methods of preliminary fractionation prior to analysis were considered. The most satisfactory method is that employing column separation, using macroreticular absorbent resins and dividing the wastewaters into hydrophobic and hydrophilic fractions. By subsequent use of ion exchange resins, each fraction was subdivided into acid, neutral, and basic subfractions. These subfractions yielded materials suitable for gas chromatography/mass spectrometric analysis performed by Finnigan Company. To identify the numerous compounds contained in each subfraction produced by the resin chromatographic separation, a GC/MS equipped with a computer library of mass spectra of 31,331 compounds was used. The peaks eluting from the GC can be individually and immediately analyzed for their spectra which can be compared to those in the computer library.

0109 Environmental Aspects

REFER ALSO TO CITATION(S) 1542, 1544, 1610, 1611, 1612, 1613, 1614, 1621, 1629, 2078, 2958, 2961, 3031, 3032, 3036

1582 **(BNL—51305) Human exposure to particulate emissions from power plants.** Rowe, M.D. (Brookhaven National Lab., Upton, NY (USA)). May 1981. Contract AC02-76CH00016. 270p. NTIS, PC A12/MF A01. Order Number DE83000770.

Portions of document are illegible.

Results from computer simulation modeling of long-range transport of fine-particle emissions from a standard coal-fired power plant are aggregated into frequency distributions of concentration and human exposure throughout the United States. These distributions represent the uncertainty of exposure levels attributable to location of emission sources. Results are presented by Air Quality Control Region and for the continental United States; they can be aggregated to any appropriate region. An example of an application of this information is presented using emission and dose-response data for polycyclic organic matter. Health impacts of a randomly located standard coal-fired power plant are estimated to be 0.12 excess deaths per year from cancer caused by exposure to polycyclic organic matter, with a range of 0.022 to 0.34 excess deaths attributable to uncertainty of the emission factor and uncertainty of source location.

1583 **(DOE/ET/10159—T21) Preliminary evaluation of environmental issues on the use of peat as an energy source.** King, R.; Richardson, S.; Walters, A.; Boesch, L.; Thomson, W.; Irons, J. (UOP/SDC, Joint Venture, McLean, VA (USA)). 14 Mar 1980. Contract AC01-78ET10159. 304p. (TR—80/025-001). NTIS, PC A14/MF A01. Order Number DE83000820.

A study to characterize the environmental issues, that would arise from an extensive peat utilization program has been initiated. The objectives of this preliminary report are to: identify the environmental issues and potential problems; examine the significance of issues in the geographical regions where peat use could be developed; and establish a methodology by which issues can be resolved or clarified through future coordinated private, state, and federal programs. An overview of peat development including discussions on conversion technologies, extraction and harvesting procedures, and land reclamation is presented. Environmental concerns are in the areas of water resources and quality, air quality, health and safety issues, solid waste management, and land reclamation. The general environmental issues, resource availability, and attitudes associated with potential peat development in ten states, containing an estimated 90 percent of US peat resources were described. The ten states reviewed are Alaska, Minnesota, Michigan, Maine, North and South Carolina, Wisconsin, New York, Florida, and Louisiana. (DMC)

1584 **(DOE/ET/14746—4) Assessment of health, safety, and environmental impacts of DOE coal conversion processes. Third technical progress report, 1 October 1981-31 December 1981.** Bratina, J.E.; Craun, J.C.; Fillo, J.P.; Jefcoat, I.A.; Nakles, D.V.; Rittmeyer, R.W.; Vance, S.W.; Weber, R.C. (Carnegie-Mellon Inst. of Research, Pittsburgh, PA (USA); Environmental Research and Technology, Inc., Pittsburgh, PA (USA)). Mar 1982. Contract AC01-80ET14746. 117p. NTIS, PC A06/MF A01. Order Number DE83001356.

This technical progress report covers the period from October 1, 1981 through December 31, 1981. An engineering assessment of the H-Coal sampling program addresses the samples from Run Nos. 6, 7 and 8 with respect to pilot plant operation and relevance of samples collected to commercial scale materials. A summary of the H-Coal sampling priority rationale recommends a prioritization methodology developed for the H-Coal sampling program. A technical review of the Department of Energy's environmental, health and safety research and development program plan for surface gasification of coal resulted in a methodology being presented to aid in the evaluation and prioritization of research and development activities. The experimental program of the CMIR PDU gasifier provides data for seven additional experimental runs conducted in the reporting period. The test results to date are discussed.

1585 **(DOE/RA/50404—1232-App.B-Vol.1) Preliminary technical data report: WyCoalGas project water system.. Final technical report, November 1980-May 1982.** (WyCoalGas, Inc., Douglas, WY (USA)). 1982. Contract FC02-81RA50404. 148p. NTIS, PC A07/MF A01. Order Number DE83001051.

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The WyCoalGas, Inc. Proposed coal gasification plant site is approximately 16 miles north of Douglas, Wyoming, located generally in Sections 27 and 34, T35N, R70W of the sixth prinicpal meridian. The plant site is located in typical high plateau plains of central Wyoming. Climate in the area is typical of semi-arid central Wyoming and is subject to wide variations in temperature. Precipitation in the area averages about 14 inches per year, of which about 10 inches fall during the April-September irrigation season. Projected water requirements at the plant site are 6020 acre-feet per year. Since the proposed plant site is not near any major streams or rivers, water must be transported to it. Water will be supplied from four sources - two surface water and two groundwater. The two surface water sources are LaPrele Reservoir and flood flows from the North Platte River with a 1974 appropriations date. LaPrele Reservoir is located approximately 14 miles west of Douglas, Wyoming, and is shown on Figure A-1. Water will be released from LaPrele Reservoir and flow down LaPrele Creek to the North Platte River. Water from the North Platte River will be diverted at a point in Section 7 of T33N, R71W. The LaPrele water and excess water from the North Platte will be pumped from the river and stored in Panhandle Reservoir No. 1, which is also referred to as Combs Reservoir. A pipeline will convey water from Panhandle Reservoir No. 1 to the coal gasification plant site. The two groundwater sources are located north of Douglas and west of Douglas.

1586 **(DOE/RA/50404—1232-App.B-Vol.2) Preliminary technical data report: WyCoalGas project water system. Final technical report, November 1980-May 1982.** (WyCoalGas, Inc., Douglas, WY (USA)). 1982. Contract FC02-81RA50404. 188p. NTIS, PC A09/MF A01. Order Number DE83001052.

Portions of document are illegible.

1587 **(DOE/RA/50404—1232-App.Q-Vol.1) Environmental impact statement: preliminary draft. Final technical report, November 1980-May 1982.** (WyCoalGas, Inc., Douglas, WY (USA)). 1982. Contract FC02-81RA50404. 414p. NTIS, PC A18/MF A01. Order Number DE83001083.

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The proposed WYCOAL GAS project is described in detail: Coal gasification plant, water supply facilities, product pipeline, railway, coal mine and waste facilities. The numerous federal and state permits and licenses are considered. Interrelationships with other planned projects and alternatives (mainly alternates or transport routes) are considered. Finally such topics are considered as: meteorology, air quality, noise topography, geology, geologic hazards (earthquakes and landslides), soils, hydrology, water quality and supply (surface and ground water), vegetation, wild life, aquatic biology, endangered species, recreation resources, land use, cultural resources and socio-economic factors. (LTN)

1588 **(DOE/RA/50404—1232-App.Q-Vol.2) Environmental impact statement: preliminary draft. Final technical report, November 1980-May 1982.** (WyCoalGas, Inc., Douglas, WY (USA)). 1982. Contract FC02-81RA50404. 385p. NTIS, PC A17/MF A01. Order Number DE83001084.

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This volume is mainly devoted to the effects of plant construction and operation on: meteorology, air quality, noise, geology, topography, geologic hazards (erosion, landslides, etc.), soils, hydrology, water quality (with some discussion of supply and seasonal variations). Possible measures for mitigating some of the adverse effects are considered. (LTN)

1589 **(DOE/RA/50404—1232-App.Q-Vol.3) Environmental impact statement: preliminary draft. Final technical report, November 1980-May 1982.** (WyCoalGas, Inc., Douglas, WY (USA)). 1982. Contract FC02-81RA50404. 288p. NTIS, PC A13/MF A01. Order Number DE83001085.

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This report addresses biological resources that may be affected by the construction, operation, maintenance, or abandonment of components of the WyCoalGas coal gasification project. The need for this separate document arises from the CEQ guidelines which limit the final EIS to a discussion of only those impacts which are anticipated to be significant. The report is organized into two major sections: Affected Environment and Environmental Consequences. These sections describe the terrestrial and aquatic biological resources in the project area, and the biological impacts which would be anticipated to result from project implementation, respectively. Discussions in each section are organized by project component and consider vegetation, terrestrial wildlife, aquatic biota, and threatened and endangered species. All biological data upon which impacts are assessed in this document were collected from state and federal resource agencies, technical libraries and literature, and regional authorities, prior to July 1981.

1590 **(EPRI-CS—2574) Coal-waste artificial-reef program, Phase 4A.** Parker, J.H.; Woodhead, P.M.J.; Duedall, I.W.; Carleton, H.R. (State Univ. of New York, Stony Brook (USA). Marine Sciences Research Center). Sep 1982. 361p. NTIS, PC A16/MF A01. Order Number DE83001249.

The Coal Waste Artificial Reef Program (C-WARP) has continued to investigate the environmental effects of disposing of fly ash and scrubber sludge in the ocean in the form of stabilized blocks. An artificial reef was constructed in the Atlantic Ocean with 500 tons of coal waste blocks on 12 September 1980. To detect potential environmental effects due to the presence of the reef and to determine the success of the coal waste blocks as a substrate for colonizing organisms, several biological studies were conducted. Results to date indicate that the blocks were colonized within weeks after placement in the ocean and the fish population was quickly established. The resident fish community was sampled and fish were tagged and released in order to estimate population size and rate of growth. Bioassays for toxicity were also conducted with sensitive life forms. The chemical behavior of the blocks exposed to seawater was monitored by determining the elemental composition and mineralogy of blocks retrieved from the reef site. Their results have not revealed major changes that would indicate premature failure of the blocks exposed to seawater. The structural integrity of the blocks has been maintained after one year in the sea. The strength of the blocks was periodically measured to detect changes in structural integrity and included in situ ultrasonic testing of blocks on the ocean bottom. Laboratory results have produced significant correlation between compressive strength and sound velocity through the block. The results of this non-destructive testing produce a history of strength development for each block showing gradual increases throughout the exposure period. As the program continues and chemical and physical changes stabilize, accurate predictions of the lifetime of the blocks should be possible.

1591 **(PB—82-192667) Energy mineral rehabilitation inventory and analysis: Henry Mountain coal field: EMIRA (Energy Mineral Rehabilitation Inventory and Analysis) report No. 15, (summary). Final report.** McKell, C.M. (Utah State Univ., Logan (USA)). 15 May 1978. 31p. NTIS, PC A03/MF A01.

This report notes and summarizes known baseline information relative to the coal deposits in the Henry Mountain Resource area in South Central Utah. Findings from chemical and biological analyses of eight geologic cores obtained from the overburden are correlated with field plantings on geologic outcrops and representative soils identified by a soil conservation service soil survey. Potential for rehabilitation is discussed and recommended procedures are presented.

1592 **(PB—82-192675) Energy mineral rehabilitation inventory and analysis: Henry Mountain coal field: EMIRA (energy mineral rehabilitation inventory and analysis) report No. 15. Final report.** McKell, C.M. (Utah State Univ., Logan (USA)). 15 May 1978. 293p. NTIS, PC A13/MF A01.

This report notes and summarizes known baseline information relative to the coal deposits in the Henry Mountain Resource area in South Central Utah. Findings from chemical and biological analyses of eight geologic cores obtained from the overburden are correlated with field plantings on geologic outcrops and representative soils identified by a soil conservation service soil survey. Potential for rehabilitation is discussed and recommended procedures are presented.

1593 **(PB—82-194200) Resource and potential reclamation evaluation: Taylor Creek study site, Axial Basin coal field; EMIRA (energy mineral rehabilitation inventory and analysis) report no. 3 - 1975. Final report 1975-78.** (Bureau of Land Management, Denver, CO (USA)). 1975. 214p. NTIS, PC A10/MF A01.

Resources are assessed for reclamation potential at the Taylor Creek Study Site, 22 miles south of Craig in northwestern Colorado. Site specific analyses were conducted for climate, physical profile, geology, soils, vegetation and hydrology. Sufficient data was collected to point out problems and minimize adverse effects of mining. The data collected was not sufficient to develop detailed reclamation plans or lease stipulations.

1594 **(PB—82-195694) Reduction of airborne contaminants from welding exhaust at surface mines. Information circular/1982.** Derby, G.K. (Bureau of Mines, Spokane, WA (USA). Spokane Research Center). Feb 1982. 17p. NTIS, PC A02/MF A01.

The Bureau of Mines studied the problems caused by airborne contaminants from welding exhaust in surface mining operations and investigated equipment designed to reduce existing hazards. Four commercially available welding-fume exhaust units were tested to determine their effectiveness. Results indicated that the four units had the capability of controlling airborne particulate concentrations and bringing them to within allowable exposure limits.

1595 **Environmental aspects of the Department of Energy's underground coal conversion program.** Zukor, S.H.; Burwell, E.L. (U.S. Department of Energy, Washington, DC). pp 16.3-16.20 of Environmental aspects of non-conventional energy resources - II. Saint Clair, A.E. La Grange Park, IL; American Nuclear Society (1978).

From ANS meeting on environmental aspects of non-conventional energy resources; Denver, CO, USA (26 Sep 1978).

The Department of Energy's Underground Coal Conversion Program is described, with emphasis on environmental activities. The basic underground coal gasification (UCG) process is explained, along with potential advantages and problem areas. Results to date indicate that the environmental impacts of UCG will be minimal and well within the capability of current environmental control technology. When compared to alternate uses of coal, UCG may offer significant environmental advantages, especially in areas of the country where high-quality water is in short supply.

0110 Reserves And Exploration

1596 **(ANL/LRP—18) Alaskan coal: resources and developmental constraints.** Edgar, D.E.; Onesti, L.J.; Kaszynski, G.M. (Argonne National Lab., IL (USA)). Mar 1982. Contract W-31-109-ENG-38. 139p. NTIS, PC A07/MF A01. Order Number DE83000860.

Portions of document are illegible.

Alaska has great physical diversity, unparalleled scenic beauty, abundant natural resources, and environmental conditions unlike those of any other state. The state's sparse population is concentrated principally in Anchorage, Fairbanks, and Juneau, and there is a significant native populace living in isolated small villages. The economy is based primarily on fishing, timber, and petroleum industries; wages and cost of goods and services are above the national average. Environmental conditions exhibit great variability from one region of the state to another. Use of natural resources in the past has been hampered by unsettled land ownership; future development will be constrained by the severe climate, widespread permafrost, and inadequate transportation facilities. Alaska has perhaps as much coal as that found in all of the 48 conterminous states. Most of the coal deposits are located in the North Slope Basin and associated strata extending beneath the Chukchi Sea, the Nenana Basin of the interior, and the Cook Inlet Basin in the south. Most Alaskan coal is subbituminous to bituminous with relatively high moisture and ash content, moderate heat value, and very low sulfur content; many deposits are well suited for surface mining. At present, only one commercial coal mine is operating in Alaska; it is situated in the Nenana Basin about 160 km south of Fairbanks. Mining should increase dramatically in the next few years, however, in response to a developing Far East market. Near-term increases in production will probably come from the existing mine and from new mines in the interior and south-central regions of the state. Because there is limited experience in Alaskan surface coal mining and reclamation, research should be conducted in order to develop cost-effective mining and reclamation technologies that minimize or prevent adverse impacts on Alaska's unique ecosystems.

1597 **(DOE/ET/14693—T9) Peat deposits of Pamlimarle peninsula: Dare, Hyde, Tyrrell, and Washington Counties, North Carolina.** Ingram, R.L.; Otte, L.J. (North Carolina Univ., Chapel Hill (USA). Dept. of Geology; East Carolina Univ., Greenville, NC (USA). Dept. of Geology). Jul 1982. Contract AC01-79ET14693. 48p. NTIS, PC A03/MF A01. Order Number DE82019810.

Approximately 582 sq mi of the Pamlimarle peninsula in northeastern North Carolina are underlain by peat that has less than 25% ash. The peat occurs in broad shallow depressions up to 10 ft thick and in narrow former stream channels up to 16 ft thick. The average thickness is about 4 ft. Total peat resources in the 582 sq mi (373,000 acres) are about 278 million tons of moisture-free peat. The deposits greater than 4 ft thick occupy an area of 273 sq mi (175,000 acres) containing 196 million tons of peat. The peat lies to the east of an old shoreline, the Suffolk Scarp, and occurs at elevations from 20 ft to sea level. There is a topographic break at 5 to 10 ft elevation which separates the deposits into a higher Western Area and a lower Eastern Area. Western and Eastern area peat differ in some respects. The higher elevation Western Area peats are slightly more decomposed and less fibrous, have a higher Btu/lb (median of 10,300 vs 9500), have less ash (mean of 6% vs 10%), have more carbon (median of 61% vs 57%), have less moisture (mean of 81% vs 88%), have a higher bulk density, and have less sulfur (median of 0.2% vs 0.4%). Two main types of peat are present: (1) a brown, decomposed somewhat fibrous peat usually found at the base of the thicker peats, and (2) a black, fine-grained, highly decomposed peat that usually overlies the more fibrous peat. Undecomposed logs and stumps are common. 4 figures, 10 tables.

1598 **(ORNL/TM—8481) Sources of coal reserve data.** Skolits, D.; Lee, R. (Oak Ridge National Lab., TN (USA)). Nov 1982. Contract W-7405-ENG-26. 98p. NTIS, PC A05/MF A01. Order Number DE83001703.

This report is a partially annotated bibliography of sources of coal reserve data and information for the United States. The references are divided into General Sources, including those containing data for all or large portions of the United States, and into individual sections for each state. Items that are parts of recurring series are identified by an asterick. In addition to the bibliographies, the authors conducted an independent survey of appropriate data sources. Attention was given primarily to those data sources having estimates of the quantity and geographical location of coal resources. Studies that report only on carbonizing properties, preparation characteristics, sulfur content or other analyses were not included.

0120 Mining

REFER ALSO TO CITATION(S) 1593, 1594, 1630, 1631, 1633

1599 **(BMFT-FB-T—82-021) Development of high-production coal faces by advancing working in thick seams of inclined formation.** Welzel, E. (Bundesministerium fuer Forschung und Technologie, Bonn (Germany, F.R.)). Feb 1982. 91p. (In German). NTIS (US Sales Only), PC A05/MF A01. Order Number DE82750520.

Beginning from 1979 the techniques applied to shallow coal faces were introduced little by little also in inclined faces but only when chainless advance systems came up, the safety requirements were met to apply coal cutting also in the steeper faces. A preliminary test with the chainless haulage system Eicotrack combined with EDW 300-L double-ended shearer loader was run in the Ida/Ernestine coal face (2.65 up to 3.60 m thickness, 20 to 30° dip). As to the experimental face Wellington 4 (West) (2.10 up to 2.80 m thickness, 35 to 45° dip), the present state of the art only permitted a single shearer loader (EW 300-L) in conjunction with the improved Eicotrack haulage system. For more than 5 months an average daily production of 1748 t was achieved. Further improvement of the performance failed due to the drivage of the supply gate stable; the manufacturing order for a stable cutting machine specifically designed for the purpose was no longer placed for reasons of time. The inconveniences of mechanizing stable cutting activities were solved in the second experimental face Karl 4 (West) (2.70 up to 3.50 m thickness, 38 to 45° dip). The upper drum of the novel-type double-ended shearer loader (EDW 150-2L-2W) was able to cut the stable coal up to the supply gate. Average output was as high as 1923 t/day within the 3 best months. Mechanization of the application of roadside packing materials by using a mobile shuttering hat to be abandoned due to sealing problems in this dipping range.

1600 **(BMFT-FB-T—82-028) Mine gas driven heat pump for coal mining.** Pilz, B.; Schmitz, D.; Oelert, G.; Weisweiler, M.; Gramatte, W. (Bundesministerium fuer Forschung und Technologie, Bonn (Germany, F.R.)). Mar 1982. 221p. (In German). NTIS (US Sales Only), PC A10/MF A01. Order Number DE82750553.

Subject of the research was the development of a plant concept and the demonstration of its application for the use of primary energy on a low energy level. Several process variants were compared and discussed. The result is a compression heat pump plant which is driven by means of combustion engines run by mine gas which utilizes mountain heat of coal mines of great depth as energy

source. This plant has the following advantages: The energy resources mine gas and mountain heat can be used sensibly; the plant can favourably be integrated into district heat nets; the internal hot-water supply and the central heating of coal mines can be covered with such a plant. The result of the analyse shows the feasibility of large plans concerning the use of presently ignored primary energy like mine gas and mountain heat by means of heat pumps. Based on the large use on coal mines considerable savings in political economics can be achieved.

1601 **(BMFT-FB-T—82-058) Improved coal winning in Zollverein 7/8 seam by toe-in plough 9.30 v supplied by GEW Luenen.** Schwolow, G.; Dornack, M.; Plich, H. (Bundesministerium fuer Forschung und Technologie, Bonn (Germany, F.R.)). Apr 1982. 58p. (In German). NTIS (US Sales Only), PC A04/MF A01. Order Number DE82750651.

The project aimed at mining Zollverein 7/8 seam more efficiently than with drag-hook ploughs. Zollverein 7/8 seam is characterized by mechanically tough coal changing, seam thickness, a somewhat 'corrugated' shape, and a soft floor. Comparative investigations on one toe-in plough face and one drag-hook plough face in two neighbouring panels of said seam were made for individual plough travels as well as over several months of operation. These investigations were backed up by measuring. The measuring conditions were identical in both panels. The face equipments were identical except for the plough systems. The energy pick-up relative to the web is by 43% lower with the toe-in plough compared to the drag-hook plough. As to wear, for the toe-in plough in comparison to the drag-hook plough twice the longevity of the latter was recorded. For the noise level on the plough guides only marginal difference in favor to the toe-in plough could be recorded. Analyses of dust and particle-size distribution showed no obvious advantages for either of both plough systems.

1602 **(DOE/EIA/10295—T1) Coal production data systems validation. Final report.** Kauffman, P.; Walton, D.; Rondum, S.; Meike, C.; Turner, S.; Erard, M.; Cushing, D.; Linz, P.; Moser, T.; Borgo, S. (Management Engineers, Inc., Reston, VA (USA); Analytic Systems, Inc., Annandale, VA (USA); CAP Gemini, Inc., Vienna, VA (USA)). 30 Sep 1982. Contract AC01-80EI10295. 120p. NTIS, PC A06/MF A01. Order Number DE83000155.

Portions of document are illegible.

This report presents an evaluation of the EIA-7A coal production system along with specific recommendations to streamline system operations and increase data accuracy. The report addresses four major areas of system operations. These areas are: survey frame maintenance, survey nonresponse, survey edit procedures (both manual and automated) and survey data accuracy and cycle duration. Within each area, specific problems or considerations are discussed and potential system changes are presented. In addition, an executive summary is provided at the beginning of the report which summarizes the major findings of the validation project and the major recommendations needed to achieve validation objectives. It is important to recognize that this document is not the singular result of the validation project but rather it represents the culmination of a series of specific reports which treat each of these areas in-depth. A listing of each project deliverable is available at the end of the field report for the reader's convenience.

1603 **(DOE/ET/10025—T2) Shearer haulage-speed constraints. Final technical report.** Mezack, G. (Foster-Miller Associates, Inc., Waltham, MA (USA)). Jun 1982. Contract AC01-78ET10025. 233p. NTIS, PC A11/MF A01. Order Number DE83001777.

Portions of document are illegible.

The principal consideration to be applied to an interpretation of the results of this study is its applicability to long-walling conditions in general. Admittedly this is a very limited study; however, certain aspects of the study can be generally applied to conditions throughout the industry. Briefly they are: (a) The half-face method or mining with double-ended shearer is prevalent in the United States. It can, therefore, be concluded that the problem of loading coal under the shearer generally exists. This would be most certainly true for state-of-the-art shearers (400 or greater installed horsepower) when one considers that the shearers in this study were mining in seam height greater than 68 in. (b) Reliability of the equipment and all other factors contributing to downtime are the principal constraints to production. This is also true throughout the industry. It should be noted that where the impact of lost time is least, the possibilities of increasing production by reducing the impact of haulage speed constraints would be greatest. With respect to the instrumentation, the most important point to be made is the fact that total power and haulage power measurement can be accomplished, and that conclusions regarding machine cutting and loading efficiency and power constraints can be identified. Specific recommendations are made in Section 5.4.3, concerning system modifications to increase performance and reliability of the package. In general, however, the success of any future attempts to monitor shearers should utilize a much more integrated system, with special provisions being made for sensors and including data transmission away from the hostilities of the face area.

1604 **(DOE/ET/12558—T1-Vol.1) Single-entry Longwall study. Volume I: report. Final report, May 1982.** (North American Mining Consultants, Inc., New York (USA)). May 1980. Contract AC01-77ET12558. 244p. NTIS, PC A11/MF A01. Order Number DE82019861.

Portions of document are illegible.

This study is an effort to determine legal and technical constraints on the introduction of single entry longwall systems to US coal mining. US mandatory standards governing underground mining are compared and contrasted with regulations of certain foreign countries, mainly continental Europe, relating to the employment of longwall mining. Particular attention is paid to the planning and development of entries, the mining of longwall panels and consequent retrieval operations. Sequential mining of adjacent longwall panels is considered. Particular legal requirements, which constrain or prohibit single entry longwall mining in the US, are identified, and certain variances or exemptions from the regulations are described. The costs of single entry systems and of currently employed multiple entry systems are compared. Under prevailing US conditions multiple entry longwall is preferable because of safety, marginal economic benefit and compliance with US laws and regulations. However, where physical conditions become hazardous for the multiple entry method, for instance, in greater depth or in rockburst prone ground, mandatory standards, which now constrain or prohibit single entry workings, are of doubtful benefit. European methods would then provide single entry operation with improved strata control.

1605 **(DOE/ET/12558—T1-Vol.2) Single-entry Longwall study. Volume II: Appendices. Final report, May 1982.** (North American Mining Consultants, Inc., New York (USA)). May 1982. Contract AC01-77ET12558. 314p. NTIS, PC A14/MF A01. Order Number DE82019719.

Portions of document are illegible.

1606 **(DOE/PC/52274—T1) Mining research and development program. First quarterly report, March 25, 1982-June 25, 1982.** Sendlein, L.V.A. (Southern Illinois Univ., Carbondale (USA). Coal Extraction and Utilization Research Center). 1982. Contract FG22-82PC52274. 17p. NTIS, PC A02/MF A01. Order Number DE82020995.

Portions of document are illegible.

During this quarter, six technical project activities were operating: Hydraulic Fragmentation, Analysis of Economics and Productivity in Strip Mining, Integration of Man and Machine into Efficient Mining, Computer Models for Simulation in Coal Mining, Geotechnical Studies Related to Advanced Mining, and Dragline Simulator Training Systems. Progress in these areas is described briefly.

1607 **(NP—2904451) Steinkohlenbergbauverein - annual report 1980.** (Steinkohlenbergbauverein, Essen (Germany, F.R.)). 1981. 129p. (In German). NTIS (US Sales Only), PC A07/MF A01. Order Number DE82904451.

Developments in the world energy market require the restructuring of the energy economy, where hard coal will have the special task of taking over a growing contribution toward our energy supplies in the future. The German hard coal mining industry is therefore trying to provide the necessary output and to im-

prove its technical performance in all areas from coal mining to coal processing. Research and development for these tasks will require the same future investment as ensuring current production. A considerable part of the research and development projects is carried out in the context of a long term total programme of the Mining Association. The present report gives information about the progress made in 1979 in mining technology and pit safety, and in coal conversion.

1608 **(NP—2904459) Report on the activities of the Mining Authorities in North Rhine Westphalia in 1979.** (Ministerium fuer Wirtschaft, Mittelstand und Verkehr des Landes Nordrhein-Westfalen, Duesseldorf (Germany, F.R.)). 1980. 104p. (In German). NTIS (US Sales Only), PC A06/MF A01. Order Number DE82904459.

First, there is a report on the general development in different branches of mining up to 1979. Then the organisation and responsibility of mining authorities, mining technology and safety, work and health protection and the relationship between mining and the environment are explained in separate chapters. There is an appendix in 73 parts which tabulates the results.

1609 **(NP—2904737) Aspects to be considered when planning coal mines, with particular regard to the pits and mining machinery.** Mueller, K.E. (Technische Hochschule Aachen (Germany, F.R.)). 16 May 1980. 132p. (In German). NTIS (US Sales Only), PC A07/MF A01. Order Number DE82904737.

Thesis.

Information is given on coal mine planning in Germany, i.e. coal mines with unfavourable deposit conditions and a high cost level, with the objective of keeping domestic coal production on an acceptable economic level. The layout of modern coal mines is discussed along with the parameters influencing the planning of new mines (size, output, coal reserves). The planning of a new mine with its underground and surface installations is described. Components and machinery of a modern coal mine are named. Shaft sinking and shaft internals, efficient conveyor systems, ventilation systems, floors, and surface installations are investigated as elements of a modern mine.

1610 **(PB—82-185570) Summary of fish and wildlife information needs to surface mine coal in the United States. Part 3. A handbook for meeting fish and wildlife information needs to surface mine coal: OSM Region I. Final report.** Hinkle, C.R.; Ambrose, R.E.; Wenzel, C.R. (Science Applications, Inc., Oak Ridge, TN (USA)). Feb 1981. 381p. NTIS, PC A17/MF A01.

The report contains information to assist in protecting, enhancing, and reducing impacts to fish and wildlife resources during surface mining of coal. It gives information on the premining, mining, reclamation and compliance phases of surface mining. Methods and sources to obtain information to satisfy state and Federal regulations are presented. This volume is specifically for the states of Maine, Vermont, New Hampshire, Massachusetts, Connecticut, New York, Rhode Island, Pennsylvania, New Jersey, Delaware, Maryland, West Virginia and Virginia.

1611 **(PB—82-185588) Summary of fish and wildlife information needs to surface mine coal in the United States. Part 3. A handbook for meeting fish and wildlife information needs to surface mine coal: OSM Region II. Final report.** Hinkle, C.R.; Ambrose, R.E.; Wenzel, C.R. (Science Applications, Inc., Oak Ridge, TN (USA)). Feb 1981. 368p. NTIS, PC A16/MF A01.

The report contains information to assist in protecting, enhancing, and reducing impacts to fish and wildlife resources during surface mining of coal. It gives information on the premining, mining, reclamation and compliance phases of surface mining. Methods and sources to obtain information to satisfy state and Federal regulations are presented. This volume is specifically for the states of Kentucky, Tennessee, North Carolina, South Carolina, Georgia, Alabama, Mississippi and Florida.

1612 **(PB—82-185596) A summary of fish and wildlife information needs to surface mine coal in the United States. Part 3. A handbook for meeting fish and wildlife information needs to surface mine coal: OSM Region III. Final report.** Hinkle, C.R.; Ambrose, R.E.; Wenzel, C.R. (Science Applications, Inc., Oak Ridge, TN (USA)). Feb 1981. 367p. NTIS, PC A16/MF A01.

The report contains information to assist in protecting, enhancing, and reducing impacts to fish and wildlife resources during surface mining of coal. It gives information on the premining, mining, reclamation and compliance phases of surface mining. Methods and sources to obtain information to satisfy state and Federal regulations are presented. Considerable emphasis is placed on postmining assistance. This volume is specifically for the states of Minnesota, Wisconsin, Michigan, Illinois, Indiana and Ohio.

1613 **(PB—82-185604) Summary of fish and wildlife information needs to surface mine coal in the United States. Part 3. A handbook for meeting fish and wildlife information needs to surface mine coal: OSM Region IV. Final report.** Hinkle, C.R.; Ambrose, R.E.; Wenzel, C.R. (Science Applications, Inc., Oak Ridge, TN (USA)). Feb 1981. 363p. NTIS, PC A16/MF A01.

The report contains information to assist in protecting, enhancing, and reducing impacts to fish and wildlife resources during surface mining of coal. It gives information on the premining, mining, reclamation and compliance phases of surface mining. Methods and sources to obtain information to satisfy state and Federal regulations are presented. This volume is specifically for the states of Nebraska, Iowa, Kansas, Missouri, Oklahoma, Arkansas, Texas and Louisiana.

1614 **(PB—82-185612) Summary of fish and wildlife information needs to surface mine coal in the United States. Part 3. A handbook for meeting fish and wildlife information needs to surface mine coal: OSM Region V. Final report.** Hinkle, C.R.; Ambrose, R.E.; Wenzel, C.R. (Science Applications, Inc., Oak Ridge, TN (USA)). Feb 1981. 405p. NTIS, PC A18/MF A01.

This report contains information to assist in protecting, enhancing, and reducing impacts to fish and wildlife resources during surface mining of coal. It gives information on the premining, mining, reclamation and compliance phases of surface mining. This volume is specifically for the states of Washington, Idaho, Montana, North Dakota, South Dakota, Wyoming, Oregon, California, Nevada, Utah, Colorado, Arizona and New Mexico.

1615 **(PB—82-194911) Geologic structures in coal mine roof. Rept of investigations/1982.** Moebs, N.N.; Ellenberger, J.L. (Bureau of Mines, Pittsburgh, PA (USA). Pittsburgh Research Center). Feb 1982. 22p. NTIS, PC A02/MF A01.

Studies by the Bureau of Mines have identified geologic structures in mine roof rock that contribute to many roof falls in Appalachian coal mines. These structures, including paleochannels, scours, pinchouts, slickensides, clay veins, crevasse splays, and joints, can often be identified during, and sometimes before, mine development. Mine projections can be revised to reduce the adverse effects of discontinuities in roof structure; large roof areas of laminated sandstone or incompetent strata generally can be delineated or inferred from exploratory drill hole data, and the need for supplementary support can be anticipated. Accurate descriptions of roof geology also provide some indication of optimum length and type of roof bolts that should be installed.

1616 **(PB—82-200486) Undercut and fill system for pitching coal. Open file report Aug 79-Jun 81.** Mangolds, A.; Fisk, A. (Foster-Miller Associates, Inc., Waltham, MA (USA)). Jun 1981. 95p. NTIS, PC A05/MF A01.

A study of the technical and economic feasibility of using a unique undercut and fill system developed by Bureau of Mines engineers to mine steeply pitching coal is discussed. The undercut and fill system combines hydraulic coal cutting with unassisted gravity fluming of the coal slurry. Mining occurs across strike and the extended entry is backfilled to provide uniform strata control and an impermeable water and air barrier. Subsequent mining occurs be-

neath the previously filled stope such that the roof consists of a solid, controlled back.

1617 **(PB—82-202235) The relation of geology to mine roof conditions in the Pocahontas no. 3 coalbed. Information circular/1982.** Moebs, N.N.; Ferm, J.C. (Bureau of Mines, Pittsburgh, PA (USA). Pittsburgh Research Center). Mar 1982. 14p. NTIS, PC A02/MF A01.

Bureau of Mines studies of mine roof fall problems in the Pocahontas No. 3 Coalbed of southern West Virginia and southwestern Virginia have established that type and sequence of rock are significant factors in roof competence. The poorest conditions occur where the immediate roof consists of slump structures and slickensided rock. The best conditions occur where the roof consists of a sequence that coarsens upward from shale to massive sandy shale. A small manual of color photographs of rock types was devised to aid in identifying drill cores. Proper identifications should enhance the prediction of areas of potential roof problems in advance of mining.

1618 **(PB—82-204868) Hybrid computer system for optimization of extraction procedures in tabular coal deposits. Open file report (final) 23 Feb 75-30 Aug 76.** Hardy, M.P.; Christianson, M.C. (Minnesota Univ., Minneapolis (USA). Dept. of Civil and Mineral Engineering). Feb 1977. 70p. NTIS, PC A04/MF A01.

The hybrid computer facility at the University of Minnesota was designed to analyze three-dimensional pillar stresses in coal mines. This report describes recent improvements and applications that include expansion of the capability to model nonlinear seam behavior, installation of a color video output display monitor, and further development of software capabilities. To demonstrate the capability of the system, the influence of nonlinear seam behavior response on the occurrence of coal mine bumps was fully investigated. Then the effect of improper mining sequence on bump occurrence was demonstrated. Also, the system was applied to the analysis of a series of practical coal mine problems. Mines in three coal seams were analyzed to investigate the parameters that contribute to the occurrence of coal mine bumps.

1619 **Anti-incendive coal cutter bits.** Cheng, L.; Liebman, I. US Patent Application 319,862. 9 Nov 1981. 13p.

The invention is an improved cutter bit, useable with a material cutting mining machine, wherein the bit has an elongated shank portion which retains a cutting tip portion. The tip portion is enlarged in cross-section at its junction with the shank to partially mask the adjacent interface shank surface and thereby protect the shank from exposure at the point of impact. Two basic designs embody the invention. One is a mushroom shaped tip and the other is a dovetail tip/shank design.

0130 Transport And Handling

REFER ALSO TO CITATION(S) 1519, 1527, 1533, 1566

1620 **(DOE/ET/14287—T1) Novel high-gradient magnetic separation processes for desulfurization of dry pulverized coal for utility applications. Final technical report, January 1, 1982.** Liu, Y.A. (Auburn Univ., AL (USA)). Jun 1982. Contract AC01-79ET14287. 121p. NTIS, PC A06/MF A01. Order Number DE82021888.

The project was concerned with the experimental development and demonstration of novel fluidized-bed, high-gradient magnetic separation (HGMS) processes for the removal of inorganic sulfur and ash from dry pulverized coal. By incorporating a number of improved processing methods and auxiliary equipment innovations into the fluidized-bed approach developed at Auburn University and patented by the US Department of Energy, pilot-scale HGMS process development units of both cyclic electromagnetic and superconducting types were successfully designed and constructed. Test results have demonstrated the significance of using higher field intensities provided by the new superconducting PDU for desulfurization of utility boiler feed coals (70 to 80% minus 200-mesh) without any external size classifications and ultrafines removal prior to magnetic separation. The results have shown the advantages of certain auxiliary process components, such as the automatic internal vibration/washing system, in maximizing the sulfur reduction, Btu recovery, and processing throughput. Quantitative effects of major operating variables and conditions on the grade and recovery of the magnetically cleaned coal and on the capacity of process operation were systematically investigated through factorial designs of experiments. The results showed that the new fluidized-bed HGMS processes could reduce the sulfur-Btu ratios of both Pennsylvania Upper Kittanning and Upper Freeport coals by 55 to 70% and achieve average Btu recoveries of 85 to 95%. Test results obtained with an Ohio Pittsburgh No. 8 coal of a high organic sulfur content indicated that it could not be effectively cleaned by the magnetic approach. Ranges of major operating variables and conditions for optimizing the performance of the new processes for desulfurization of dry pulverized coal were identified.

1621 **(LA—9492-MS) Leaching behaviors of low-sulfur coals and coal wastes from three Western coal-preparation plants.** Heaton, R.C.; Wangen, L.E.; O'Rourke, J.A.; Nyitray, A.M.; Jones, M.M.; Wagner, P. (Los Alamos National Lab., NM (USA)). Sep 1982. Contract W-7405-ENG-36. 46p. NTIS, PC A03/MF A01. Order Number DE83002309.

Low-sulfur coal and coal waste samples from three coal preparation plants located in the western United States were examined to determine whether storage piles or waste piles composed of these materials might release contaminated drainages into the environment. These studies revealed that, as far as trace element releases are concerned, such western coal and coal waste piles pose no threat to environmental quality. Leachates obtained through laboratory leaching tests were neutral or very slightly alkaline in pH and contained negligible amounts of most trace elements. All elements studied were within acceptable limits according to the Environmental Protection Agency Multimedia Environmental Goals/Minimum Acute Toxicity Effuent (EPA MEG/MATE) system of evaluation. According to x-ray diffraction data, these samples contain only small amounts of pyrite, no strongly alkaline minerals, and detectable levels of carbonate minerals such as calcite and dolomite, which are capable of buffering the pH in the neutral range. The major mineral components detected were quartz, plagioclase feldspars, and mixed-layer micaceous or montmorillonite-type clays. These latter components often serve as repositories for trace elements that can be mobilized under appropriate leaching conditions. We ascribe the innocuous leaching behaviors of these materials to the neutral pH of the leachates, a condition that renders most trace elements immobile. If other materials capable of altering the pH of the leachates are mixed with or codisposed with coal wastes of this type, the resulting mixtures may release trace elements in significant amounts.

1622 **(PB—82-192915) Ship coal bunkering facilities. Final report.** Greenberg, J.S.; Palmer, D.T. (ECON, Inc., Princeton, NJ (USA)). Mar 1982. 169p. NTIS, PC A08/MF A01.

This report presents a summary of a study undertaken to develop a 'first-cut' analysis of the alternatives to provide ship coal bunkering facilities in selected U.S. ports. The study provides a preliminary examination of the economic and financial feasibility of coal bunkering facilities in nine ports. A site independent bunkering facility was developed capable of receiving coal from both land and water transport and delivering the bunkered coal to ships via barge or dockside shiploaders. As a result of site visits, the site independent facility was made site specific for each of the ports and equipment requirements, capital expenditures, operating costs and expenses estimated. Demand forecasts were also made to establish throughput requirements. Financial (including sensitivity) analyses and risk analyses were performed on the site specific facilities. The results of these analyses together with the site independent and dependent facilities are described in this report.

0140 Combustion

REFER ALSO TO CITATION(S) 1525, 2056, 2439, 2440, 2497, 2515

1623 **(AD-A—113533/4) Coal-oil mixtures problems and opportunities.** Thompson, J.F. Jr. (Army Facilities Engineering Support Agency, Fort Belvoir, VA (USA). Technology Support Div.). 15 Jan 1982. 26p. NTIS, PC A03/MF A01.

This report presents the problem areas and identifies solutions for implementing Coal-Oil Mixture Technology. The report also contains an overview of industrial and Government experiences in fuel production, stabilization, and combustion. The report provides references and points of contact/addresses of those manufacturers currently involved in Coal-Oil Mixture Technology.

1624 **(BMFT-FB-T—82-031) Power plant concepts using new coal conversion technologies.** Emsperger, W.; Engelhardt, R.; Goebel, K.; Schiffers, U.; Traenkenschuh, H.; Wittchow, E. (Bundesministerium fuer Forschung und Technologie, Bonn (Germany, F.R.)). Mar 1982. 223p. (In German). NTIS (US Sales Only), PC A10/MF A01. Order Number DE82750556.

Alternatives to pulverized coal firing are presented for the use even of low-grade coals in large power plant units. The unit ratings and potential efficiencies of such plants are defined and the main determining parameters are analyzed. The problems of start-up and part load operation are also discussed. Considerations for the selection of gasification methods for power plant processes are summarized as a basis for power plant concepts using coal gasification. Furthermore the state of development of the gasification and gas scrubbing processes is described. Conceptual plant configurations and unit ratings are presented. The studies demonstrate that there is an incentive to construct power plant processes that incorporate fluidized bed combustion or coal gasification but that a number of development problems remain to be solved for commercial application to become viable.

1625 **(DOE/NASA/13111—11) Evaluation of advanced combustion concepts for dry NO/sub x/ suppression with coal-derived, gaseous fuels.** Beebe, K.W.; Symonds, R.A.; Notardonato, J. (General Electric Co., Schenectady, NY (USA); National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center). 1982. Contract AI01-77ET13111. 16p. (NASA-TM—82985; CONF-821018—4). NTIS, PC A02/MF A01. Order Number DE83001399.

From IEEE/ASME/ASCE joint power generation conference; Denver, CO, USA (17 Oct 1982).

A test program has been completed to determine the emissions performance of a rich-lean combustor (developed for liquid fuels in Phase I of the DOE/LeRC Advanced Conversion Technology Project) for combustion of simulated coal gases ranging in heating value from 167 to 244 Btu/scf (7.0 to 10.3 MJ/NCM). The 244 Btu/scf gas is typical of the product gas from an oxygen-blown gasifier, while the 167 Btu/scf gas is similar to that from an air-blown gasifier. NO/sub x/ performance of the rich-lean combustor did not meet program goals with the 244 Btu/scf gas because of high thermal NO/sub x/, similar to levels expected from conventional lean-burning combustors. The NO/sub x/ emissions are attributed to inadequate fuel-air mixing in the rich stage resulting from the design of the large central fuel nozzle delivering 71% of the total gas flow. NO/sub x/ yield from ammonia injected into the fuel gas decreased rapidly with increasing ammonia level, and is projected to be less than 10% at NH_3 levels of 0.5% or higher. NO/sub x/ generation from NH_3 is significant at ammonia concentrations significantly less than 0.5%. These levels may occur depending on fuel gas cleanup system design. CO emissions, combustion efficiency, smoke and other operational performance parameters were satisfactory. A test was completed with a catalytic combustor concept with petroleum distillate fuel. Reactor stage NO/sub x/ emissions were low (1.4g NO/sub x//kg fuel). CO emissions and combustion efficiency were satisfactory. Airflow split instabilities occurred which eventually led to test termination.

1626 **(DOE/NASA/13111—12) Combustion of coal-gas fuels in a staged combustor.** Rosfjord, T.J.; McVey, J.B.; Sederquist, R.A.; Schultz, D.F. (United Technologies Corp., East Hartford, CT (USA). Research Center; United Technologies Corp., South Windsor, CT (USA). Power Systems Div.; National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center). 1982. Contract AI01-77ET13111. 11p. (NASA-TM—82987; CONF-821018—8). NTIS, PC A02/MF A01. Order Number DE83001100.

From IEEE/ASME/ASCE joint power generation conference; Denver, CO, USA (17 Oct 1982).

Gaseous fuels produced from coal resources have been considered for use in industrial gas turbines. Such fuels generally have heating values much lower than the typical gaseous fuel, natural gas; the low heating value could result in unstable or inefficient combustion. Additionally, coal gas fuels may contain ammonia which if oxidized in an uncontrolled manner could result in unacceptable NO/sub x/ exhaust emission levels. Previous investigations have indicated that staged, rich-lean combustion represents a desirable approach to achieve stable, efficient, low NO/sub x/ emission operation for coal-derived liquid fuels containing up to 0.8-wt % nitrogen. An experimental program has been conducted to determine whether this fuel tolerance can be extended to include coal-derived gaseous fuels. The results of tests with three nitrogen-free fuels having heating values of 100, 250, and 350 Btu/scf and a 250 Btu/scf heating value doped to contain 0.7% ammonia are presented. The test results permit the following conclusions to be drawn: (1) Staged, rich-lean combustion represents the desirable approach to achieve ultra-low NO/sub x/ and CO emissions for coal gas fuels with heating values of 210 kJ/mol (238 Btu/scf) or higher. (2) Lean combustion represents the desirable approach to achieve ultra-low NO/sub x/ and CO emissions for coal gas fuels with low heating values (84 kJ/mol (95 Btu/scf)). (3) Staged combustion has the ability to limit NH_3 to NO/sub x/ conversion rates to less than 5%. NO/sub x/ emissions below the EPA limit can readily be achieved.

1627 **(PB—82-199738) At-sea test and demonstration of coal-oil mixture as a marine boiler fuel. part I: shoreside testing. Final report Nov 81-Mar 82.** Wagoner, C.L.; Eckhart, C.F.; Clark, G.A. (Babcock and Wilcox Co., Alliance, OH (USA). Contract Research Div.). Apr 1982. 199p. NTIS, PC A09/MF A01.

This report documents laboratory and wear-loop experimental evaluations and a combustion test using a full-scale Marine burner and fuel-supply equipment using a coal/oil mixture (COM). Laboratory work led to selection of a fuel acceptable for use in a shipboard demonstration from six candidate COMs. Significant variations were discovered among these samples, and an appropriate final selection was made for the shipboard tests. This COM was further evaluated during a land-based combustion test using a Marine burner (30 million-Btu/hr scale) installed in an industrial package boiler. Comparative tests using No. 6 fuel oil and the selected COM were performed along with a general shakedown and test run of the pump and heating set designed for the at-sea demonstration. Combustion tests indicated that the replacement of No. 6 fuel oil with the proper COM is quite feasible. However, close attention must be given to the handling and atomization of this fuel. A modified T-jet atomizer performed with acceptable levels of wear, plugging, and ash disposition problems. It was concluded that an at-sea demonstration of the COM should be pursued.

0150 Marketing And Economics

REFER ALSO TO CITATION(S) 2432

1628 **(NP—2904735) Annual report 1980.** (Verein Deutscher Kohlenimporteure e.V., Hamburg (Germany, F.R.)). Jul 1981. 125p. (In German). NTIS (US Sales Only), PC A06/MF A01. Order Number DE82904735.

Energy economy developments of the world, the EC, and West Germany are discussed. The main subject of the report is the coal market and trade which depends on political decisions and concepts but also on the availability of other primary energy

sources such as oil and nuclear power. According to the Verein Deutscher Kohlenimporteure, coal imports should be fully liberalized. The situation of the various countries in the field of coal is illustrated by so-called country reports with tables on energy consumption, coal imports, etc.

0160 Health And Safety

REFER ALSO TO CITATION(S) 1535, 1536, 1552, 1584, 3035

1629 **(ORNL/TM—7680/S1) Publications in Life Sciences Synthetic Fuels of Oak Ridge National Laboratory.** Rickert, L.W. (comp.). (Oak Ridge National Lab., TN (USA)). Oct 1982. Contract W-7405-ENG-26. 55p. NTIS, PC A04/MF A01. Order Number DE83001701.

This list of publications includes publications through mid-1982. The list represents the principal elements of the Life Sciences Synthetic Fuels Program at Oak Ridge National Laboratory, namely: (1) characterization, measuring, and monitoring research to develop sampling and analytical techniques and surveillance instrumentation; (2) industrial hygiene efforts to identify and monitor potential health hazards to employees; (3) biological studies centered on the identification and screening of potentially hazardous materials and assessment of dose-response relationships for chronic or acute exposures; (4) environmental transport analyses to investigate material dispersion, reconcentration, and impact on biological communities; (5) environmental control research to develop techniques for effluent and emission reduction; and (6) assessments concerned with optimizing plant siting and operation through development and applications of methods for risk analysis. Publications are listed by author and in a permuted title index.

1630 **(PB—82-189929) Chronic respiratory disease in coal miners: follow-up study of two mining communities in West Virginia. Technical report.** Higgins, I.T.T.; Oh, M.S.; Whittaker, D.E. (Michigan Univ., Ann Arbor (USA)). Apr 1981. 199p. NTIS, PC A09/MF A01.

A follow up study was conducted of chronic respiratory disease in coal miners in Mullens and Richwood, West Virginia. From 1972 to 1974 a follow up of all persons who were living in Mullens and Richwood in 1963 to 1964 was carried out. In addition, a new census was taken and an attempt was made to examine all men and women aged 20 to 74 years old. The examination included a British Medical Research Council respiratory symptoms questionnaire, occupational history, measurement of ventilatory lung function and postero anterior and lateral chest radiographs. The mortality rate was higher in miners and ex-miners than in non-miners. In each town, standardized mortality ratios were slightly above those expected for West Virginia; those for miners and ex-miners were appreciably elevated with the ratio in Mullens on the border line of significance at the 5% level. High ratios were found in both towns in miners and ex-miners for respiratory diseases with ratios higher in smokers than in non-smokers. Radiographic changes of pneumoconiosis were detected in 23% of miners and ex-miners in Mullens and in 11% in Richwood. Early degrees of progressive massive fibrosis were recorded in 5% of miners in Mullens and in 2% in Richwood.

1631 **(PB—82-194853) Dust deposition in coal mine airways. Technical progress report.** Courtney, W.G.; Kost, J.; Colinet, J. (Bureau of Mines, Pittsburgh, PA (USA). Pittsburgh Research Center). Feb 1982. 20p. NTIS, PC A02/MF A01.

The Bureau of Mines conducted an exploratory field survey to determine the amount of airborne coal dust, the size distribution of the dust, and the rate of dust deposition in coal mine airways. The survey was taken at eight underground locations in operating coal mines. The rate of dust deposition in the airways depended upon the concentration of airborne dust and decreased exponentially with distance from the dust source. A sample rock-dusting schedule for that return is presented; that is, the trickle duster should be operated for 3 1/2 hours after every five shifts to protect the average deposit of new float coal dust in the return, but operation after every three shifts is preferred, to protect an occasional heavier deposit.

1632 **(PB—82-196627) Respirator test procedure.** Myers, W.R. (National Inst. for Occupational Safety and Health, Morgantown, WV (USA)). Jun 1976. 30p. NTIS, PC A03/MF A01.

Equipment and test procedure used by the NIOSH Testing and Certification Branch to evaluate the effectiveness of respiratory protective devices against mists of silica and other materials having a threshold limit value not less than 0.05 milligrams per cubic meter are described. Test requirements for such devices are set forth in the Federal Register, Part 11, Subpart 11.140-7 for maximum allowable penetration, and Subpart 11.140-9 for maximum allowable breathing resistances before and after testing.

1633 **(PB—82-201336) Diagnostics of sealed coal mine fires. Report of investigations/1982.** Kuchta, J.M.; Furno, A.L.; Dalverny, L.E.; Sapko, M.J.; Litton, C.D. (Bureau of Mines, Pittsburgh, PA (USA). Pittsburgh Research Center). Mar 1982. 32p. NTIS, PC A03/MF A01.

The Bureau of Mines investigated four simulated coal gob fires to obtain a more reliable data base for defining the state of a sealed mine fire and to evaluate the performance of various fire detectors. The fires were conducted in a multiple-entry section of the Bruceton Experimental Mine by heating 4,000 to 21,000 pounds of rubblized bituminous coal to ignition and monitoring the temperature, gas emissions, and smoke under ventilated and sealed combustion conditions. Product gas concentrations depended upon the coal bed size, coal temperature, heating rate, and oxygen concentration or ventilating condition but varied little after the fires were sealed. Expressions are given that define the temporal variation of CO and O2 after sealing when the coal temperature decreased rapidly. The CO/CO2 ratio is a more sensitive fire indicator than the CO/delta O2 ratio, although the latter is universally used for detecting the incipient state of a coal fire.

02 PETROLEUM

0203 Drilling And Production

REFER ALSO TO CITATION(S) 1676

1634 **(BMFT-FB-T—82-019) Evaluation of casing loads in deep wells test of casing pipes for deep wells.** Marx, C.; Burkowsky, M.; Schlueter, H. (Bundesministerium fuer Forschung und Technologie, Bonn (Germany, F.R.)). Feb 1981. 113p. (In German). NTIS (US Sales Only), PC A06/MF A01. Order Number DE82750521.

Tests of oil field pipes under simulated bore hole conditions are necessary to improve analytical methods to calculate collapse strength of pipes. Within the project a novel pipe testing facility (RP-2) was conceived and set up. Test range: pipe diameter up to 7, max. collapse pressure 3500 bar, max. axial load 2 MN. -Main results: Evidence of higher collapse strength for oil field pipe with typical diameter-wall thickness ratio 20 compared to API calculations. Strength reserve: up to 40%. Superposition of axial loads for pipes with higher D/t-ratios does not influence collapse strength over a wide range of axial loads. Total collapse strength of pipe-in-pipe cemented systems was evaluated. Influence of cement strength under bore hole conditions was shown. Gas tightness of special connections under various axial loads was studied and suggestions for improvement were made. For 10-3/4 MUST-C connections a finite analysis was made that takes torque loads during make-up into account.

1635 **(DOE/BC/10033—4) Evaluation of the Bodcau (Bellevue) in-situ combustion project.** Trantham, J.C. (Keplinger and Associates, Inc., Tulsa, OK (USA)). Oct 1982. Contract AC19-80BC10033. 46p. NTIS, PC A03/MF A01. Order Number DE83001335.

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A cost-shared commercial scale demonstration in situ combustion project was conducted in the Bodcau Fee lease of the Bellevue Nacatoch Reservoir near Shreveport, Louisiana. The 19-acre, five-pattern project was started in July, 1976. The five injection wells were ignited in August and September, 1976, with an

electrical heater. Six months of dry burning was followed by simultaneous air and water injection and finally, late in the project, heat scavenging water injection was carried out. As of February 28, 1982, 667,609 barrels of tertiary oil had been produced, compared with 700,00 barrels predicted. The operation has yielded attractive economics under the prevailing economic climate. An explosion occurred in the air compression/injection system.

1636 **(DOE/SF/01424—45) Big Muddy Field Low-Tension Flood Demonstration Project. Fourth annual report, April 1981-March 1982.** Painter, T. (Conoco, Inc., Casper, WY (USA)). Sep 1982. Contract AC03-78SF01424. 124p. NTIS, PC A06/MF A01. Order Number DE83000260.

During 1981, about two-thirds of the low-tension slug was injected. By year-end, the oil cut had increased from 0.6 to over 2%. Injection rates were less than predicted. The viscosity of the slug was reduced from 20 to 14 cp. Following the viscosity reduction, the injection rate continued to decline from 65,000 to 50,000 barrels per month by year-end. An oil response has apparently occurred from the low-tension slug injection, with tracer appearance in only Well 88. The plant operation is now satisfactory. By year-end, the filter operation was satisfactory. The blending system produced satisfactory concentrations throughout the year. Laboratory support work is being done on field treatments of sulfonate-containing crude. A family of chemicals has been developed for a two-stage field treating operation; the first stage for demulsification and the second stage for extraction of the sulfonate from the crude oil. All of the sulfonate has been manufactured and quality control tests were run on each batch. While differences between batches could not be discerned by chemical analysis, the amount of alcohol required for phase stability at constant temperature differed between batches. It was found that if the required isobutyl alcohol (IBA) for phase stability was added, the oil recovery was about the same for each batch. 90 figures, 20 tables.

1637 **(DOE/SF/01802—61) Bell Creek field micellar-polymer pilot demonstration. Final report, June 1976-March 1982.** Goldburg, A. (Gary Energy Corp., Englewood, CO (USA)). Sep 1982. Contract AC19-78SF01802. 110p. NTIS, PC A06/MF A01. Order Number DE83000259.

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In June 1976, Gary Energy Corporation initiated a DOE cost-shared 40-acre micellar-polymer demonstration project in Unit A of the Bell Creek Field, Powder River County, Montana. This pilot project was located in the northern part of the unit in an area in which the original line drive waterflood had been in operation since August 1970. The 40-acre pilot 5-spot was developed in 1977 by infill drilling four injection wells and an observation well adjacent to one of the injectors. This report summarizes all aspects of the pilot demonstration project. A discussion of the reservoir geology and fluid chemistry, chemical flood process design, and an analysis of overall project performance, including estimates of total secondary and tertiary incremental oil recoveries, are presented. A reservoir engineering analysis included detailed examination of data from pressure pulse testing, injection of radioactive tracers, and logs and cores from the five new infill wells. The analysis indicated the presence of a permeability barrier across the southeast quadrant of the 40-acre confined area. The Uniflood oil-external micellar-polymer process was chosen for application in the pilot. Union Oil company designed the process specifically for the Bell Creek reservoir rock and fluid system. A caustic preflush slug of 18.0% pore volume (PV) was injected, followed by a 3.9% PV micellar slug. A viscosity tapered polymer slug of 100% PV was specified for injection after the micellar slug to provide mobility control. Conventional water injection into the pilot 5-spot was started in October 1977, and continued through January 1979. This pattern waterflood period was necessary to allow time for the completion of the reservoir analysis. Micellar process injection commenced during February 1979, with injection of the preflush. As of March 31, 1982, 77% PV of the polymer slug had been injected.

1638 **(DOE/SF/10888—T1) Evaluation of alternatives for production of heavy oil using mining, drilling, and steam stimulation.** Ware, C.H. Jr. (Commercilization Insights, Tampa, FL (USA)). Aug 1982. Contract AP03-79SF10888. 111p. NTIS, PC A06/MF A01. Order Number DE82021659.

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The technical and economic feasibility of two underground mining approaches to steam-stimulated production of heavy oil (less than 20° API gravity) was evaluated compared with steam injection using wells drilled from the surface. Five heavy oil producers generally agreed that the long horizontal wells of the vertical borehole-horizontal well (VB-HW) method might achieve more uniform and complete contact of oil by steam while improving the efficiency of oil collection. No advantage was seen for development of an extensive mine complex over or under a heavy oil-bearing zone other than to facilitate drilling more (short) wells into the nearby oil zone over a given area. Technical, economic and institutional factors were analyzed. More conducive factors and fewer constraints were found for the VB-HW approach than for the mine-over-oil-zone (MOOZ) method. Heavy oil mining techniques were judged to be generally constrained by future performance improvements of conventional surface steam-assisted production operations. A computerized technical/economic evaluation model was used to describe both the extensive underground mine development (MOOZ) approach and the VB-HW method. Base Case technical/economic descriptions and profitability projections were made reflecting those in each of these studies. Some sensitivity analyses were made by extrapolation of the Base Case conditions. This was limited by the sparseness of Base Case performance data. Overall, while the mining costs for the VB-HW method approach those of the MOOZ as depth of the oil zone increases, VB-HW drilling costs do not escalate with increasing oil zone thickness as they do with the MOOZ method. Thus, the VB-HW method costs less to use than the MOOZ for thicker oil zones up to depths ranging to at least 1600 ft. Only production from deep, thin oil zones appear to be favored by MOOZ costs.

1639 **(LBL—14118) Pressure-transient testing with a partially penetrating well in a two-layer reservoir.** Javandel, I.; Witherspoon, P.A. (Lawrence Berkeley Lab., CA (USA)). Jul 1982. Contract AC03-76SF00098. 11p. (CONF-820927—7). NTIS, PC A02/MF A01. Order Number DE83000499.

From 57. AIME Society of Petroleum Engineers annual technical conference and exhibition; New Orleans, LA, USA (26 Sep 1982).

Portions of document are illegible.

Estimating flow properties of a heterogeneous reservoir consisting of two or more layers with different flow properties is often a problem of great interest to reservoir engineers. Analysis of pressure transient data from a partially penetrating well producing from either layer of a two-layer reservoir may be used to estimate the individual transmissivities. An analytic solution has been derived to investigate the transient pressure response of two-layer reservoirs with cross-flow. Results of the analytic method have been verified using a finite-element model and they reveal important details of pressure transient behavior such as the limiting conditions for detecting a multilayer situation. A procedure has been developed to evaluate the permeability of the producing layer as well as that of the second layer. The method can be applied to both pressure build-dup and interference well tests. As has been previously shown from earlier numerical techniques, the early-time response of such a two-layer reservoir producing from a fraction of the thickness of one of the layers closely follows the behavior of a single-layer case. An inflection point in the pressure response can be expected under certain circumstances, and this provides important data. At large times the system behaves like an equivalent homogeneous reservoir. 8 figures.

1640 **(SAND—82-1336) Project DEEP STEAM. Quarterly reports, October 1, 1981-March 31, 1982.** Marshall, B.W.; Aeschliman, D.P.; Clay, R.G.; Lee, D.O.; Moreno, J.B.; Muir, J.F. (Sandia National Labs., Albuquerque, NM (USA)). Sep 1982. Contract AC04-76DP00789. 57p. NTIS, PC A04/MF A01. Order Number DE83001659.

The objective of Project DEEP STEAM is to support the development of technology required to economically produce heavy oil from deep reservoirs. The tasks included in this project are: (1) development of thermally-efficient delivery systems; and (2) development of downhole steam generator systems. During the period October 1, 1981-March 31, 1982, evaluation of several types

of insulated tubulars was completed in an instrumented test tower, laboratory testing of a high pressure, ceramic lined, downhole steam generator developed by Foster Miller was completed at Sandia, and field evaluation of several types of insulated tubulars was initiated. Progress continued on the Min-Stress II packer concept at L'Garde, Inc., and work was completed on the extruded metal packer at Foster Miller. Field testing of the Sandia designed downhole diesel/air generator and the surface diesel/oxygen generator continued throughout the period. The test program on both systems was completed near the end of this period; initial efforts were started to remove the equipment from the field test site. 25 figures, 4 tables.

1641 **Effect of hydrotropic salts on phase relationships involving hydrocarbons, water, and alcohols.** Patience, C.H.; Kraus, K.A. (Oak Ridge Natl Lab, Tenn, USA). *SPEJ, Society of Petroleum Engineers Journal;* **22**: No. 3, 363-370(Jun 1982).

Hydrotropic salts, which can increase the solubility of organic materials in aqueous solutions, are of interest in a variety of industries including those related to tertiary oil recovery. The authors have examined effects on solubility of hydrocarbons in water (with and without alcohols) by adding inorganic hydrotropic salts such as perchlorates, thiocyanates, and iodides (high in the usual Hofmeister series), organic salts such as short chain alkyl benzene sulfonates, and other salts based on substituted benzene derivatives. It is found that while miscibilities decrease with increase in chain length of the hydrocarbon, the hydrotropic properties in these systems increase rapidly with the number of alkyl carbons on the benzene ring of the salts, and they are relatively insensitive to the type of charged group (sulfonate vs. carboxylate) attached to the benzene ring. 21 refs.

1642 **Characterization and oil recovery observations on a series of synthetic petroleum sulfonates.** Malmberg, E.W.; Gajderowicz, C.C.; Martin, F.D.; Ward, J.S.; Taber, J.J. (Sun Prod Co). *SPEJ, Society of Petroleum Engineers Journal;* **22**: No. 2, 226-236(Apr 1982).

Synthetic sulfonates for application in enhanced oil recovery are of increasing interest. Because of the need to explore the range of candidates potentially available at various costs from the petrochemical industry, a series of nine samples was prepared for distribution with financial support of the U.S. DOE. This study briefly describes the samples and, in more detail, the characterization of the samples for oil recovery. The characterization included determination of optimal salinity, stability of aqueous dispersions in brines containing sodium chloride and calcium ion, and oil recovery and loss of sulfonate in 1-ft (0.305-m) Berea cores. 17 refs.

0204 Processing

REFER ALSO TO CITATION(S) 1521, 2215, 2495

1643 **(NP—2904718) Investigation into the preparation of new catalysts for reforming and hydrocracking.** Fuchs, F. (Stuttgart Univ. (TH) (Germany, F.R.)). 1981. 109p. (In German). NTIS (US Sales Only), PC A06/MF A01. Order Number DE82904718.

Thesis.

Hydrocracking catalysts are prepared in the first part by impregnation of zeolites with organometallic compounds of nickel, palladium and platium as compler catalysts Ni-Pd-Ni- zeolite Y and Ni-Pt-Ni-zeolite X and these have been applied and tested. The first named contact exhibits the greatest activity of all also compared to tested hydrocracking catalysts (100% conversion under given operational conditions); at the same time there is a high selectivity related to isomerization products. The Ni-Pt-Ni contact hydroisomerzes the starting material up to 60 wt%. The second part of the work deals with testing platium and tin complexes impregnated aluminium oxide carriers as reforming catalysts for their activity and selectivity. The selectivity of the catalysts can be largely controlled by varying the tin content. The interaction of the metals with each other and the carrier is the main topic of research in both test series.

0205 Products And By-products

REFER ALSO TO CITATION(S) 1643

0206 Health And Safety

REFER ALSO TO CITATION(S) 3090

1644 **(PNL—3991) Assessment of research and development (R & D) needs in LPG safety and environmental control.** DeSteese, J.G. (Pacific Northwest Lab., Richland, WA (USA)). May 1982. Contract AC06-76RL01830. 418p. NTIS, PC A20/MF A01. Order Number DE83000880.

Portions of document are illegible.

The report characterizes the LPG industry covering all operations from production to end use, reviews current knowledge of LPG release phenomenology, summarizes the status of current LPG release prevention and control methodology, and identifies any remaining safety and environmental problems and recommends R & D strategies that may mitigate these problems. (ACR)

0207 Marketing And Economics

REFER ALSO TO CITATION(S) 2416, 2432

1645 **(AD-A—113337/0) Reducing U.S. vulnerability to oil supply disruptions.** Baer, W.S. (RAND Corp., Santa Monica, CA (USA)). Jul 1980. 16p. NTIS, PC A02/MF A01.

The vulnerability of the United States to oil supply disruptions is at least as serious as the more chronic economic problems of import dependence. Measures to deal with the vulnerability problem include: increasing oil purchases for the Strategic Petroleum Reserve; providing incentives for private stockpiling; and developing emergency preparedness plans. This does not mean that we should delay current measures to reduce overall import dependence, such as the decontrol of oil and gas prices. But we must focus more clearly on the vulnerability problem itself as the most critical short-term energy issue for the United States and our allies. Only if we are prepared to weather oil supply disruptions in the next few years will we be able to devise longer-term solutions to our energy problems.

1646 **(DOE/RG/10572—T1-Vol.3-Bk.1) Analytical history of the entitlements program. Volume III. Entitlement rules. Book I, August 1974-December 1976.** (Department of Energy, Washington, DC (USA). Economic Regulatory Administration). Aug 1982. 167p. NTIS, PC A08/MF A01. Order Number DE83000523.

Portions of document are illegible.

This is the third of three volumes prepared for the Economic Regulatory Administration (ERA) of the Department of Energy (DOE). In Volumes II and III, pertinent Federal Register publications are presented in chronological order of publication. Both volumes serve as entitlement program records and as a reference source for the analytical history presented in Volume I. This analytical history has been prepared to achieve the following objectives: to provide a single, comprehensive historical and analytical record of the entitlements program; to gather under one cover a complete legislative and regulatory history of the entitlements program; to analyze all entitlements program elements to show concisely the impacts on various sectors of the industry; and to provide a reference book for use in related research activity.

1647 **(NP—2904715) WEG lecture meeting, June 16, 1981.** (Wirtschaftsverband Erdoel- und Erdgasgewinnung e.V., Hannover (Germany, F.R.)). [nd]. 19p. (In German). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82904715.

A status report is given on the German petroleum and natural gas industries, and the 1980 annual report of Wirtschaftsverband Erdoel- und Erdgasgewinnung e.V. is interpreted in its main parts.

0208 Waste Management

REFER ALSO TO CITATION(S) 1870

1648 **(DOE/CS/40338—2) North Carolina used-motor-oil re-refining program. Topical report 2. Economics and logistics: startup experience and operating projections.** (North Carolina State Government, Raleigh (USA)). Jul 1982. Contract FG01-80CS40338. 51p. NTIS, PC A04/MF A01. Order Number DE83001482.

Portions of document are illegible.

This is the second in a planned series of topical reports on a program to develop and demonstrate a state-operated re-refining system for used engine oil. The North Carolina Oil Re-Refining Facility, using a 2,000,000 gallon input per year PROP plant, was installed in late 1980. During the first year of startup operation ending December 31, 1981, approximately 137,000 gallons were produced. This was much less than expected due to many impediments; however, product quality has consistently been excellent. Capital costs to date total about $2.3 million, and it is projected that an additional $1.5 million of equipment upgrading and facility expansion/improvements will be needed before the plant will produce satisfactorily. For the first year, based on normal accrual accounting, operating costs exceeded revenues by about $350,000 and the negative cash flow was about $346,000. After upgrading, however, it is expected the plant will generate revenues sufficient to repay the investment within ten years, even assuming that the selling price of re-refined oil will not inflate faster than the cost of producing it. This report also contains sections reporting on the logistics of oil pickup and delivery and also brief descriptions of information forms and procedures developed for the facility.

0209 Environmental Aspects

REFER ALSO TO CITATION(S) 3030, 3092

1649 **(PB—82-196304) Outer continental shelf development and the North Carolina coast: a guide for local planners.** Brower, D.J.; McElyea, W.D.; Godschalk, D.R.; Lofaro, N.D. (North Carolina Coastal Energy Impact Program, Raleigh (USA)). Aug 1981. 278p. NTIS, PC A13/MF A01.

This guide supplies local governments in North Carolina's coastal region with information on (1) the facilities and activities associated with outer continental shelf (OCS) oil and gas development, (2) their impacts on coastal communities, and (3) how local governments can manage these impacts. Offshore activities and onshore facilities accompanying each stage of OCS development (leasing, exploration, field development, production, and shutdown) are described, including factors influencing facility siting, local economies, and local natural resources. The guide helps local governments apply this information by presenting ways in which they can influence the development process.

1650 **(PB—82-197351) Environmental assessment of the Alaskan continental shelf: final reports of principal investigators volume 3. physical science studies.** (National Oceanic and Atmospheric Administration, Boulder, CO (USA). Office of Marine Pollution Assessment). Oct 1981. 603p. NTIS, PC A99/MF A01.

Contents: Current measurements in possible dispersal regions of the Beaufort Sea; Physical oceanographic and meteorological conditions in the Northwest Gulf of Alaska; Oil spill trajectory simulation Lower Cook Inlet - Shelikof Strait, Alaska; Wind field transition matrix analysis Lower Cook Inlet--Shelikof Strait, Alaska; Evaluation of CODAR Data Lower Cook Inlet, Alaska; The transport and behavior of oil spilled in and under sea ice.

1651 **(PB—82-199753) Managing oil and gas activities in coastal environments. Volume I: comprehensive report. Report for 1977-81.** Longley, W.L.; Jackson, R.; Snyder, B. (RPC, Inc., Austin, TX (USA)). Mar 1982. 462p. NTIS, PC A20/MF A01.

This report documents the management of oil and gas development on national wildlife refuges on the Louisiana and Texas coasts. It explains the nature of ownership, leasing rights, and legal considerations related to oil and gas extraction on refuges. The report describes five federal refuges selected for analysis and the different marsh and estuarine ecosystems found on the refuges and in the coastal zone. It explains oil and gas extraction and transport methods used in coastal systems, and examines how each habitat is affected by these activities. Existing regulations and guidelines are analyzed and new ones proposed. The report is a planning tool for refuge personnel to aid them in assessing impacts, issuing permits, and generally managing oil and gas activities.

1652 **(PB—82-199761) Managing oil and gas activities in coastal environments. Volume II: comprehensive report. Report for 1977-81.** Longley, W.L.; Jackson, R.; Snyder, B. (RPC, Inc., Austin, TX (USA)). Mar 1982. 402p. NTIS, PC A18/MF A01.

This report documents the management of oil and gas development on national wildlife refuges on the Louisiana and Texas coasts. It explains the nature of ownership, leasing rights, and legal considerations related to oil and gas extraction on refuges. The report describes five federal refuges selected for analysis and the different marsh and estuarine ecosystems found on the refuges and in the coastal zone. It explains oil and gas extraction and transport methods used in coastal systems, and examines how each habitat is affected by these activities.

0210 Legislation And Regulation

REFER ALSO TO CITATION(S) 1646

0220 Transport, Pipelines, And Handling

1653 **(CONF-8205125—1) Medium- and high-pressure sonic leak pinpointer.** Huebler, J.E.; Craig, J.M. (Institute of Gas Technology, Chicago, IL (USA)). 1982. 7p. NTIS, PC A02/MF A01. Order Number DE83900124.

From American Gas Association distribution conference; Washington, DC, USA (3 May 1982).

This paper discusses progress at the Institute of Gas Technology over the last 4 years on a sonic leak pinpointer for medium- and high-pressure gas distribution systems (15 to 90 psi), including the current efforts to build and field-test a commercial prototype. Important advances were made in sensitivity to leak signals and elimination of background noises. These advances make the technique a practical tool for pinpointing leaks when the gas has migrated or has saturated a large area. Previous successes and failures of sonic leak detection are briefly discussed as background for understanding the sonic method in general.

0230 Properties

REFER ALSO TO CITATION(S) 1641

1654 **(AD-A—111943/7) Review of physical and chemical methods for characterization of fuels. Interim report, March 1980-December 1981.** Zoschak, R.G.; Stavinoha, L.L. (Southwest Research Inst., San Antonio, TX (USA). Army Fuels and Lubricants Research Lab.). Dec 1981. 246p. (AFLRL—151). NTIS, PC A11/MF A01.

This report provides a tabulation of chemical compounds and physical/chemical properties with methods for their determination based on a review of physical and chemical methods for characterizing liquid mobility fuels. This tabulation is cross-referenced to a list of references organized by preselected categories. A complete bibliography is provided alphabetically by author's last name, both with and without annotations. For ease in utilization and updating, a system was developed to facilitate tabulation and recall of references from a word processor in which they are stored. While this tabulation serves as reference material to a program to develop improved analytical and correlative methodology for characterizing fuels, it may be of great utility to personnel developing and analyzing fuels. This tabulation will continue to be expanded and updated periodically.

1655 **(AD-A—111982/5) Oxidative stability of deuterated lubricants.** (Geo-Centers, Inc., Newton Upper Falls, MA (USA)). Jan 1982. 40p. (GC-TR—82-182). NTIS, PC A03/MF A01.

Oxidative stability tests were performed on deuterated and non-deuterated synthetic hydrocarbons containing a proprietary antioxidant additive, tetraesters containing antioxidants, and azelate esters. The substitution of deuterium for hydrogen in these lubricant systems has resulted in a significant improvement in their oxidative stability. The 14-fold improvement observed when 98% deuterated hexanoic acid was used to prepare pentaerythritol tetrahexanoated cannot be explained by a simple kinetic isotope effect alone. The deuterated compound outlasted its non-deuterated counterpart even though the original antioxidant had been almost completely consumed within the first quarter of the evaluation. This phenomenon should be investigated in further research; and theoretical models must be developed and tested in the laboratory.

1656 **(AD-A—113490/7) Investigations of nebulizer techniques for direct determination of metals in lubricating oils by ICP. Technical report.** Algeo, J.D.; Heine, D.R.; Phillips, H.A.; Denton, M.B. (Arizona Univ., Tucson (USA). Dept. of Chemistry). 1 Feb 1982. 19p. NTIS, PC A02/MF A01.

Equipment and procedures are described which allow the analysis of metals in lubricating oils w/o need for dilution or other sample pretreatment. A sample heater has been added to a modified Babington principle nebulizer. This nebulizer is capable of producing, from undiluted oils, aerosols suitable for introduction into an Inductively Coupled Plasma Atomic Emission Spectrophotometer. Heating the samples immediately prior to nebulization greatly increases the output of aerosol and reduces variations in output due to differences in sample viscosity. The type of organometallic complex used in the preparation of standards is shown to be unimportant if the region of the plasma which is observed is well chosen.

1657 **(AD-A—113809/8) Evaluation of plasma source spectrometers for the Air Force oil analysis program. Interim report 30 Aug 77-30 Sep 80.** Rhine, W.E.; Saba, C.S.; Kauffman, R.E.; Brown, J.R.; Fair, P.S. (Dayton Univ., OH (USA). Research Inst.). Feb 1982. 354p. NTIS, PC A16/MF A01.

An investigation was conducted in order to evaluate two plasma source emission spectrometers for use in the Air Force Oil Analysis Program (OAP). The high temperatures of the plasma sources were expected to improve the Oil Analysis Program's capability to analyze wear metal particulates. The work is presented in two phases. Phase I of the work dealt with determining the capabilities of the two plasma instruments as well as the currently used OAP spectrometers. During this phase of the work the sample introduction systems were identified as the reason each instrument could not detect particles larger than 3-10 Microns. Phase II of the work dealt with optimizing the sample introduction systems so that particles could be more efficiently transported where they could be analyzed. The improved systems were capable of analyzing particles as large as 14-20 Microns.

0250 Combustion

REFER ALSO TO CITATION(S) 1623, 1627, 2456

1658 **(PB—82-180175) Control of NO/sub x/ by combustion process modifications. Final report.** Beer, J.; Jacques, M.; Farmayan, W.F. (Massachusetts Inst. of Tech., Cambridge (USA). Energy Lab.). Apr 1981. 173p. (MIT-EL—81-001). NTIS, PC A08/MF A01.

Executive Summary - A theoretical and experimental study was carried out to determine lower bounds of NOx emission from staged combustion of a 0.7% N No. 6 fuel oil. Thermodynamic and chemical kinetic calculations have shown minimum NOx emissions at fuel rich stage equivalence ratios between 1.6 and 1.8 and fuel rich stage temperatures in the range of 1900 to 2100 K (2960 to 3812°F). In the experimental investigations the use of the MIT Combustion Research Facility permitted the detailed study of aerodynamically complex industrial-type turbulent flames in thermal and chemical environments similar to those in utility boiler furnaces. The primary stage fuel equivalence ratio, the flow and mixing pattern in the flame, the level of air preheat and the mode and quality of fuel atomization, were varied to determine their effect upon the NOx and combustibles emission. Unstaged flame studies were carried out to establish baseline data for comparison with those obtained in fuel rich-lean staged flames in which a fuel rich stage was formed near the burner and the lean stage was established by the admixing of the rest of the combustion air at a distance farther downstream. Results of the computational modeling studies have shown that in the fuel rich zone of the flame the fuel bound nitrogen compounds (FBN) can be converted to molecular nitrogen N_2, which renders the FBN innocuous for forming NOx in the lean stage of the flame.

1659 **(PB—82-190935) Improved atomization of residual fuels for marine boilers. Volume III: cold flow characterization of emulsified fuels.** Smith, D.A.; LaFlesh, R.C.; Solomon, J.; Lachowicz, Y. (C-E Marine Power Systems, Windsor, CT (USA)). Feb 1982. 72p. NTIS, PC A04/MF A01.

The objectives of this research are to study the physical properties of water/oil emulsions and determine how these properties affect atomization in a non-combustion environment. A literature survey was performed to establish a technical base. An emulsifier was obtained and tests run to establish a correlation between Bunker 'C' fuel oil emulsions and model test fluid emulsions. Droplet size distribution and droplet ballistics tests were performed in the Atomizer Test Facility to demonstrate the effect that water concentration has on atomization quality.

03 NATURAL GAS

0301 Reserves

1660 **(DOE/EP—0067) Plan for protecting the natural gas resources, Naval Oil Shale Reserves No. 3, Garfield County, Colorado.** (USDOE Assistant Secretary for Environmental Protection, Safety and Emergency Preparedness, Washington, DC. Office of Naval Petroleum and Oil Shale Reserves). Jul 1982. 23p. NTIS, PC A02/MF A01. Order Number DE83001437.

Portions of document are illegible.

The Department of Energy's plan for protecting the natural gas resources of the Naval Oil Shale Reserve (NOSR) is described. It is proposed that one or more confirmation wells be drilled on NOSR-3 at the earliest practical data to verify the existence of natural gas on that Reserve in commercially producible quantities. If successful, a total of 24 wells are planned for NOSR-3 to complete the drilling program. Estimates extrapolated from the Northwest Exploration experience suggest wells completed in the Wasatch formation would yield about 200 thousand cubic feet of gas per day (MCF/D) in the first year of operation, and produce at a declining rate for 15 to 20 years. These wells are estimated to cost about $500,000, an amount which would be returned to the US Treasury as revenue from the sale of produced gas in approximately two years. The proposed communitization/unit agreements between Northwest Exploration, or other lessees of land adjacent to NOSR-3 in the buffer zone, and the Government would have several benefits. First, they would ensure that the Government is compensated for any NOSR-3 gas produced on or off the Reserve. The second benefit relates to gas underlying federal lands in the buffer zone. It is likely that some of that gas could be drained by wells producing from adjacent private lands. Communitization/unit agreements between the Department of Energy and federal lessees would generate royalty payments on the gas produced from the federal lands out-leased by the Department of the Interior. Finally, these agreements in conjunction with the proposed drilling program for NOSR-3 would permit elimination of the buffer zone, as the government's interest would be protected, and permit full development of that area. It is presently estimated that about ten such agreements would be required. The plan was accepted by the Department of Justice.

0303 Drilling, Production, And Processing

1661 **Techniques to determine natural and induced fracture relationships in Devonian shale.** Yost, A.B. II; Frohne, K.H.; Komar, C.A.; Ameri, S. (US DOE, USA). *Journal of Petroleum Technology;* 34: No. 6, 1371-1377(Jun 1982).

Extensive study of natural fractures in oriented core, well logs, induced fracture orientation, lineaments, and Seisviewer surveys resulted in a log-core correlation of subsurface fracture systems and established a relationship between surface and subsurface directional aspects of Devonian shale. Core and well log analysis techniques discussed have the potential to identify the major producing intervals in Devonian shale. 23 refs.

0304 Products And By-products

1662 **Thermodynamic evaluation of thermal recovery of gas from hydrates in the earth.** Holder, G.D.; Angert, P.F.; John, V.T.; Yen, S. (Univ of Pittsburgh, Pa, USA). *Journal of Petroleum Technology;* 34: No. 5, 1127-1132(May 1982).

An examination is made of the potential for recovering gas from naturally occurring hydrates. Factors to be considered in such a study are (1) location of the hydrate fields, (2) purity of hydrates in the reservoir, (3) types of media in which hydrates form, (4) thermodynamic conditions of temperature, pressure, and composition, and (5) thermal properties of the reservoir. Based on these considerations, calculations were made to determine the energy needed to dissociate hydrates and the amount of gas recovered per g mol of hydrate dissociated. 14 refs.

0305 Health And Safety

1663 **(PNL—4014) Overview study of LNG release prevention and control systems.** Pelto, P.J.; Baker, E.G.; Holter, G.M.; Powers, T.B. (Pacific Northwest Lab., Richland, WA (USA)). Mar 1982. Contract AC06-76RL01830. 468p. NTIS, PC A20/MF A01. Order Number DE83000914.

The liquefied natural gas (LNG) industry employs a variety of release prevention and control techniques to reduce the likelihood and the consequences of accidental LNG releases. A study of the effectiveness of these release prevention and control systems is being performed. Reference descriptions for the basic types of LNG facilities were developed. Then an overview study was performed to identify areas that merit subsequent and more detailed analyses. The specific objectives were to characterize the LNG facilities of interest and their release prevention and control systems, identify possible weak links and research needs, and provide an analytical framework for subsequent detailed analyses. The LNG facilities analyzed include a reference export terminal, marine vessel, import terminal, peakshaving facility, truck tanker, and satellite facility. A reference description for these facilities, a preliminary hazards analysis (PHA), and a list of representative release scenarios are included. The reference facility descriptions outline basic process flows, plant layouts, and safety features. The PHA identifies the important release prevention operations. Representative release scenarios provide a format for discussing potential initiating events, effects of the release prevention and control systems, information needs, and potential design changes. These scenarios range from relatively frequent but low consequence releases to unlikely but large releases and are the principal basis for the next stage of analysis.

1664 **(PNL—4090) Applications of human factors engineering to LNG release prevention and control.** Shikiar, R.; Rankin, W.L.; Rideout, T.B. (Pacific Northwest Lab., Richland, WA (USA)). Jun 1982. Contract AC06-76RL01830. 142p. NTIS, PC A07/MF A01. Order Number DE82022495.

The results of an investigation of human factors engineering and human reliability applications to LNG release prevention and control are reported. The report includes a discussion of possible human error contributions to previous LNG accidents and incidents, and a discussion of generic HF considerations for peakshaving plants. More specific recommendations for improving HF practices at peakshaving plants are offered based on visits to six facilities. The HF aspects of the recently promulgated DOT regulations are reviewed, and recommendations are made concerning how these regulations can be implemented utilizing standard HF practices. Finally, the integration of HF considerations into overall system safety is illustrated by a presentation of human error probabilities applicable to LNG operations and by an expanded fault tree analysis which explicitly recognizes man-machine interfaces.

1665 **(PNL—4153) Analysis of LNG peakshaving-facility release-prevention systems.** Pelto, P.J.; Baker, E.G.; Powers, T.B.; Schreiber, A.M.; Hobbs, J.M.; Daling, P.M. (Pacific Northwest Lab., Richland, WA (USA)). May 1982. Contract AC06-76RL01830. 144p. NTIS, PC A07/MF A01. Order Number DE83000882.

Portions of document are illegible.

The purpose of this study is to provide an analysis of release prevention systems for a reference LNG peakshaving facility. An overview assessment of the reference peakshaving facility, which preceeded this effort, identified 14 release scenarios which are typical of the potential hazards involved in the operation of LNG peakshaving facilities. These scenarios formed the basis for this more detailed study. Failure modes and effects analysis and fault tree analysis were used to estimate the expected frequency of each release scenario for the reference peakshaving facility. In addition, the effectiveness of release prevention, release detection, and release control systems were evaluated.

0306 Marketing And Economics

REFER ALSO TO CITATION(S) 1647, 2432

0308 Environmental Effects

REFER ALSO TO CITATION(S) 1649, 1651, 1652, 1664, 1665, 3036

0309 Artificial Stimulation

1666 **(PB—82-208182) Evaluation of fracturing methods for the stimulation of Devonian shale in Northern Ohio. Final report Sep 78-Mar 82.** Smith, E.C. (Columbia Gas System Service Corp., Columbus, OH (USA)). Mar 1982. 349p. NTIS, PC A15/MF A01.

Columbia drilled, stimulated, and evaluated five wells in two test areas--Lorain and Trumbull County, Ohio. They cored and extensively logged one well in each county. Foam type hydraulic fracturing served as a standard stimulation method for both areas for comparing the effects of cryogenic and displaced explosive fracturing. A comparison of core analyses from both test areas with those from gas producing areas showed that the shale sections in both areas contain adequate matrix gas for commercial production. Although they observed several gas shows in Lorain County and measured high concentrations of matrix gas in the core from both project areas, no significant gas production resulted from 16 individual stimulations in the Devonian shale sections of 10 wells in Trumbull and Lorain Counties, Ohio.

1667 **(SAND—82-2243C) Determination of in-situ stress from anelastic strain-recovery measurements of oriented core: applications to hydraulic-fracture-treatment design.** Teufel, L.W. (Sandia National Labs., Albuquerque, NM (USA)). 1983. Contract AC04-76DP00789. 2p. (CONF-830305—1-Abst.). NTIS, PC A02/MF A01. Order Number DE83000277.

From SPE symposium on low permeability; Denver, CO, USA (14 Mar 1983).

An anelastic strain recovery technique is presented as a method of determining the directions and magnitude of the principal in-situ stresses from oriented cores from deep wells. For one deep gas well in the Piceance Creek Basin, 46 of the 55 cores that were instrumented showed some measurable anelastic strain relief. Similar results were found for oriented cores from other deep wells. (DLC)

1668 **Some effects of stress, friction, and fluid flow on hydraulic fracturing.** Hanson, M.E.; Anderson, G.D.; Shaffer, R.J.; Thorson, L.D. (Lawrence Livermore Natl Lab, Calif, USA). *SPEJ, Society of Petroleum Engineers Journal;* 22: No. 3, 321-332(Jun 1982).

A study has been conducted aimed at understanding the hydraulic fracturing process, especially those phenomena and parameters that strongly affect or control fracture geometry. The theoretical and experimental studies consistently confirm the well-known fact that in-situ stress has a primary effect on fracture geometry, and that fractures propagate perpendicular to the least principal stress. In addition, the authors find that frictional interfaces in reservoirs can affect fracturing. In addition to quantifying some effects on fracture geometry caused by fractional slippage along interfaces, the authors have found that variation of friction along an interface can result in abrupt steps in the fracture path. These effects have been seen in the mineback of emplaced fractures and are demonstrated both theoretically and in the laboratory. 23 refs.

1669 **Finite element model simulations associated with hydraulic fracturing.** Advani, S.H.; Lee, J.K. (Ohio State Univ, Columbus, USA). *SPEJ, Society of Petroleum Engineers Journal;* 22: No. 2, 209-218(Apr 1982).

This study presents methodology and results pertinent to hydraulic fracture modeling for the U.S. DOE's Eastern Gas Shales Program (EGSP). The presented finite-element model simulations extend available modeling efforts and provide a unified framework for evaluation of fracture dimensions and associated responses. Examples illustrating the role of multilayering, in-situ stress, joint interaction, and branched cracks are given. Selected comparisons and applications also are discussed. 30 refs.

0320 Transport, Pipelines, And Handling

REFER ALSO TO CITATION(S) 1845

1670 **(PB—82-188186) Estimated uncertainty of calibrations of freestanding prismatic liquefied natural gas cargo tanks.** Siegwarth, J.D.; LaBrecque, J.F. (National Bureau of Standards, Washington, DC (USA)). Jan 1982. 281p. NTIS, PC A13/MF A01.

The accuracy of the tank calibrated by the photogrammetric technique was examined during the calibration of fifteen freestanding prismatic LNG transport tanks. This examination indicated that the calibration accuracy of the tanks calibrated in the storage position was better than plus or minus 0.1%. Additional factors influencing the accuracy of the calibration of the tanks, such as the effects of installing the tanks into the ship and loading the ships with LNG, were examined in the course of this work and the results are reported here. The various measurements used by various NBS personnel to analyze the calibration accuracy are detailed in the eight Appendices included in this report.

0330 Properties

1671 **(PB—82-196593) Analyses of natural gases, 1917-80. Information circular.** Moore, B.J. (Bureau of Mines, Amarillo, TX (USA). Helium Operations). Feb 1982. 1060p. NTIS, PC A99/MF A01.

This publication contains 12,554 analyses of gas samples from oil and gas wells and natural pipelines in 39 States and 24 foreign countries. These gas samples were collected in the period 1917-80 as part of the Bureau of Mines survey for helium occurrences. The gas analyses contained herein were made by several methods over the period covered. Analytical work on samples collected early in the period was done on the Orsat apparatus. The one-cut apparatus and four-cut fractional distillation equipment were added later. In 1949, a mass spectrometer was acquired and used for all gas analyses made after that time. Helium analyses throughout the period covered were made on special helium analytical equipment designed and built by the Bureau of Mines Helium Operations Laboratory.

0350 Storage

REFER ALSO TO CITATION(S) 2948

1672 **(DOE/EV/10447—T1) Release of LNG vapor from large-volume, low-pressure LNG storage. Letter report, September 30, 1981-September 30, 1982.** (Institute of Gas Technology, Chicago, IL (USA)). 1982. Contract AC01-81EV10447. 11p. NTIS, PC A02/MF A01. Order Number DE83000437.

Portions of document are illegible.

This project involves development of practical release prevention measures by developing design and operating procedures beyond current practice. The objective of the program is to obtain the quantitative field data necessary to model the physics of the tank vapor space pressure response to boil-off compressor operation and atmospheric pressure changes. This work will lead to the development of guides to LNG storage tank operation and equipment specification that will limit the possibility of vapor venting or rollover of the stored LNG.

04 OIL SHALES AND TAR SANDS

0401 Reserves And Exploration

REFER ALSO TO CITATION(S) 1660

1673 **(PB—82-195314) Mechanical properties of oil shale and overlying strata, naval oil shale reserve, Anvil Points, Colorado. Report of investigations/1982.** Dolinar, D.R.; Horino, F.G.; Hooker, V.E. (Bureau of Mines, Denver, CO (USA). Denver Research Center). Feb 1982. 50p. NTIS, PC A03/MF A01.

Physical property tests were conducted on drill core from three exploratory holes on the Naval Oil Shale Reserve near Anvil Points, Colo. Data and regression analysis curves are presented. Data obtained above the Mahogany zone were used to estimate the potential zone of surface effects from underground mining. Single specimen testing was primarily used to obtain Mohr's envelope and subsequent rock properties. The technique is shown to provide satisfactory results for this rock type with a significant reduction of core preparation and testing time.

1674 **Recent activity in U.S. tar sand.** Marchant, L.C. (U.S. Department of Energy, Laramie Energy Technology Center, Laramie, WY); Stosur, J.J. (U.S. Department of Energy, Germantown, MD); Cupps, C.Q. *Proceedings, Intersociety Energy Conversion Engineering Conference;* 1: 1-10(1980). (CONF-800806—).

From 15. intersociety energy conversion engineering conference; Seattle, WA, USA (18 Aug 1980).

A review of the U.S. tar sand resources is presented. The total oil-in-place in 550 occurrences of tar sand in 22 states is estimated to be between 25 and 36 billion barrels, of which at least 80% is located in Utah. The lack of commercial oil production is attributed to the lack of proven technology, marketability of the produced oil, and a moratorium on leasing of federally controlled tar sand properties. Current activities to develop the U.S. tar sand resources include reservoir characterization and evaluation by industry, states, and DOE, oil recovery research by industry and universities, and few field mini-tests and pilot work by industry and DOE.

0404 Oil Production, Recovery, And Refining

1675 **Evaluation of a steamflood experiment in a Utah tar sand deposit.** Johnson, L.A. Jr.; Fahy, L.J.; Romanowski, L.J. Jr.; Thomas, K.P.; Hutchinson, H.L. (US DOE, USA). *Journal of Petroleum Technology;* 34: No. 5, 1119-1126(May 1982).

Steam was injected into the center well of two concentric inverted five-spot patterns. The zone chosen for the experiment was a sandstone 45 ft (14 m) thick in the Rimrock member of the Mesa-

verde formation. The pattern area was 0.25 acres (1012 m/sup 2/) and contained a 13/degree/API (979 kg/m/sup 3/) bitumen with a viscosity greater than 10/sup 6/ cp (10/sup 3/Pa*s) at reservoir conditions. The average oil saturation was 78.9% PV. During 160 days of operation, 65,700 bbl (10.4*10/sup 3/ m/sup 3/) of water-equivalent steam were injected at 360 to 530 psig (2.5 to 3.7 MPa) and 180 to 650 B/D (29 to 103 m/sup 3//d). Total production during the test amounted to 1,150 bbl (183 m/sup 3/) of oil and 6,250 bbl (994 m/sup 3/) of water. 6 refs.

1676 **Open surface flotation method for extracted crude oil.** Bass, D.M.; Wang, F. (to Dept. of the Interior). US Patent Application 268,592. 29 May 1981. 10p.

A method is described for the separation of extracted viscous crude oil placed in a reservoir of an opened cell. Materials such as oil shale, oil sand, or tar sand may be involved. Hot water is introduced to the top surface of the reservoir material in the cell while steam is injected into a steam gallery running through the cell. The hot water and steam may contain a surfactant. The bouyancy of the crude oil creates an artificial water drive which causes the water and oil to 'flip-flop' so that the oil rises to the top of the reservoir and separates from the remainder of the reservoir material. This separated oil may be removed from the cell and the remaining material disposed of.

0407 Health And Safety

REFER ALSO TO CITATION(S) 3100

0409 Waste Research And Management

REFER ALSO TO CITATION(S) 1568

1677 **(PNL—4457) Environmental control technology for shale oil wastewaters.** Mercer, B.W.; Wakamiya, W.; Bell, N.E.; Mason, M.J.; Spencer, R.R.; English, C.J.; Riley, R.G. (Pacific Northwest Lab., Richland, WA (USA)). Sep 1982. 90p. NTIS, PC A05/MF A01. Order Number DE83001691.

This report summarizes the results of studies conducted at Pacific Northwest Laboratory from 1976 to 1982 on environmental control technology for shale oil wastewaters. Experimental studies conducted during the course of the program were focused largely on the treatment and disposal of retort water, particularly water produced by in situ retorting of oil shale. Alternative methods were evaluated for the treatment and disposal of retort water and minewater. Treatment and disposal processes evaluated for retort water include evaporation for separation of water from both inorganic and organic pollutants; steam stripping for ammonia and volatile organics removal; activated sludge and anaerobic digestion for removal of biodegradable organics and other oxidizable substances; carbon adsorption for removal of nonbiodegradable organics; chemical coagulation for removal of suspended matter and heavy metals; wet air oxidation and solvent extraction for removal of organics; and land disposal and underground injection for disposal of retort water. Methods for the treatment of minewater include chemical processing and ion exchange for fluoride and boron removal. Preliminary cost estimates are given for several retort water treatment processes.

1678 **System for utilizing oil shale fines.** Harak, A.E. (to Department Of Energy). US Patent 4,340,463. 20 Jul 1982. Filed date 13 Mar 1981. vp.

PAT-APPL-243307.

A system is provided for utilizing fines of carbonaceous materials such as particles or pieces of oil shale of about one-half inch or less diameter which are rejected for use in some conventional or prior surface retorting process. Maximum utilization of the energy content of the fines is obtained and a waste is produced which is relatively inert and of a size easy to dispose. The system includes a cyclone retort which pyrolyzes the fines in the presence of heated gaseous combustion products, the cyclone retort having a first outlet through which vapors can exit that can be cooled to provide oil, and having a second outlet through which spent shale fines are removed. A burner connected to the spent shale outlet of the cyclone retort, burns the spent shale with air, to provide hot combustion products that are carried back to the cyclone retort to supply gaseous combustion products utilized therein. The burner heats the spent shale to a temperature which forms a molten slag, and the molten slag is removed from the burner into a quencher that suddenly cools the molten slag to form granules that are relatively inert and of a size that is convenient to handle for disposal in the ground or in industrial processes.

0410 Enviromental Aspects

REFER ALSO TO CITATION(S) 3036

05 NUCLEAR FUELS

0501 Reserves

1679 **(DEMO—81/5G) Store and retrieval of field data for radioactive anomalous areas in Greece.** Minatidis, D.G.; Pippos, Ch.S. (Democritus Nuclear Research Center, Athens (Greece)). Apr 1981. 35p. (In Greek). NTIS (US Sales Only), PC A03/MF A01; Also available from Library, Democritus NRC. Order Number DE82702539.

A classification and coding scheme for the computerized storage and retrieval of field data of Greek radioactive anomalous areas detected by car-borne-scintillometer (CBS) method is described.

0502 Exploration

REFER ALSO TO CITATION(S) 1715

1680 **(GJBX—193-82) PLTSYM: a FORTRAN computer system to plot Canadian symbol location maps for hydrogeochemical and stream-sediment reconnaissance data.** Zinkl, R.J.; Shettel, D.L. Jr.; D'Andrea, R.F. Jr. (Bendix Field Engineering Corp., Grand Junction, CO (USA). Grand Junction Operations). Sep 1982. Contract AC13-76GJ01664. 141p. NTIS, PC A07/MF A01. Order Number DE83000764.

Portions of document are illegible.

The PLTSYM system plots sample location maps on a line plotter at virtually any scale with data point values represented by one of 15 Canadian symbols. Sample location data can be in latitude/longitude or (X,Y) coordinate form. Five map projections are available for converting latitude/longitude into easting/northing coordinates. Data values can be sorted into classes using any one of four different class interval options.

1681 **(GJBX—219(82)) Survey of lands held for uranium exploration, development, and production in fourteen western states for the six-month period ending June 30, 1982.** (Bendix Field Engineering Corp., Grand Junction, CO (USA)). Oct 1982. Contract AC13-76GJ01664. 24p. NTIS, PC A02/MF A01. Order Number DE83001386.

Tables are presented showing the land held (in thousands of acres) for uranium exploration according to: (1) distribution by ownership for 14 western states (state, claim, federally acquired, Indian and fee); (2) distribution by state (1976 to 1982); (3) distribution by land category (1976 to 1982). A graph is presented showing land held by uranium industry from January 1966 to January 1982. Land controlled by counties for each of the 14 states are also tabulated according to land category. (ATT)

1682 **(INIS-mf—7009) Geologic and radiometric prospect of the mine "El Muerto" Oaxaca, Mex.** Manjarrez C, E. (Instituto Politecnico Nacional, Mexico City. Escuela Superior de Ingenieria y Arquitectura). 1981. 53p. (In Spanish). NTIS (US Sales Only), PC A04/MF A01. Order Number DE83780002.

Thesis.

The studies realized in the mine demonstrated that the uranium mineral inclosure obtained in the pegmatites exists in very little concentrations and does not constitute useful deposits. Therefore, there are found rare earths minerals like monazite and euxenite so the mine may be proficient in the extraction of other type of minerals like spodumene, beryl, etc. Because of the scarce knowledges that we have about the pegmatites referring to the radiactive minerals study, it is stated the necessity of making programs perfectly coordinated and projected in the application of the metallurgic investigation that permits the increase in results of useful value, without to lose sight that the principal objective is to have a real economic, industrial and scientific view of the radiactive minerals localized in the pegmatites, considering the refractory character of the same, and the mineral little volume that in general they contain. (author).

1683 **(NBL—303) Grand Junction/New Brunswick Laboratory interlaboratory measurement program. Part I. Evaluation. Part II. Methods manual.** Trahey, N.M.; Voeks, A.M.; Soriano, M.D. (USDOE New Brunswick Lab., Argonne, IL). Sep 1982. 189p. NTIS, PC A09/MF A01. Order Number DE83001789.

This interlaboratory measurement program was conducted to provide a reference data base for comparison of measurements performed using various measurement methods under the National Uranium Resources Evaluation (NURE) Program. The design of the program also included an evaluation of the accuracies of the measurement methods used by the participating laboratories in measuring New Brunswick Laboratory Reference Materials (RMs) 101-A through 110-A, the low level uranium and thorium samples distributed in the program. Finally, consensus values for these RMs, based on participants measurement data, were calculated.

1684 **(PGJ/F—010-82) National Uranium Resource Evaluation: Walker Lake Quadrangle, California and Nevada.** Durham, D.L.; Felmlee, J.K. (Geological Survey, Menlo Park, CA (USA); Geological Survey, Denver, CO (USA); Geological Survey, Golden, CO (USA)). Sep 1982. Contract AI13-78GJ01686. 157p. NTIS PCE07/MF $5.00. Order Number DE82022282.

Includes 10 sheets of 24x reduction microfiche. Portions of document are illegible.

The Miocene Relief Peak Formation occurs in the Sierra Nevada, where it consists mainly of andesitic flows, autobrecciated flows, and mudflows. However, fluviatile rocks are common in the lower part of the formation. They contain abundant carbonaceous material, are commonly permeable, and are interbedded with less permeable rocks. The Juniper mine, the principal uranium occurrence in the fluviatile rocks, reportedly has produced more than 20 tons of U_3O_8. Although rocks of the Relief Peak Formation lack aerial radiometric uranium anomalies and generally have only average uranium content away from uranium occurrences, the fluviatile rocks of the formation are considered favorable for uranium deposits because of their lithologic characteristics and uranium occurrences. Some areas of Tertiary sedimentary rocks presently are categorized as unfavorable for the required minimum endowment. They have some geologically favorable characteristics, however, as well as indications of industry exploration activities, and they may prove to be favorable as more information becomes available.

1685 **(PGJ/F—044-82) National Uranium Resource Evaluation: Richfield Quadrangle, Utah.** Bromfield, C.S.; Grauch, R.I.; Otton, J.K.; Osmonson, L.M.; Robinson, K.; Reed, R.L.; Noah, R.J. (Geological Survey, Golden, CO (USA)). Sep 1982. Contract AI13-78GJ01686. 166p. NTIS PCE07/MF $4.60. Order Number DE83000600.

Includes 8 sheets of 24x reduction microfiche.

The Richfield Quadrangle in west-central Utah was evaluated to identify areas favorable for the occurrence of uranium deposits known or likely to contain 100 tons of uranium with an average grade of not less than 100 ppM U_3O_8. Geologic reconnaissance was made of all known environments thought to be favorable for uranium deposits, and a representative selection of uranium occurrences reported in the literature was visited. Geochemical analyses from rock and limited water samples were used in the evaluation. Preliminary and incomplete aeroradiometric data and hydrogeochemical and stream-sediment analyses arrived too late in the program to be field-checked or to be adequately analyzed for this report. Two areas favorable for uranium deposits were delineated: (1) volcanogenic deposits (class 500 to 599) in association with Miocene Mount Belknap rhyolite, and acidic plutons in the Marysvale Volcanic Field in the Antelope Range and Tushar Mountains; and (2) volcanogenic (class 500 to 599) and/or magmatic hydrothermal deposits (class 330) associated with Miocene high-silica high-alkali rhyolite tuffs, flows, and hypabyssal intrusives in volcanic or subvolcanic environments in the southern Wah Wah Mountains.

1686 **(PGJ/F—049-82) National Uranium Resource Evaluation: Escalante Quadrangle, Utah.** Peterson, F.; Campbell, J.A.; Franczyk, K.J.; Lupe, R.D. (Geological Survey, Golden, CO (USA)). Sep 1982. Contract AI13-78GJ01686. 137p. NTIS PCE07/MF $5.00. Order Number DE83001223.

Includes 7 sheets of 24x reduction microfiche. Portions of document are illegible.

Seven areas favorable for the occurrence of uranium deposits meet the minimum size and grade requirements of the National Uranium Resource Evaluation of the US Department of Energy in the Escalante 1° x 2° Quadrangle, South-Central Utah. Five areas identified in the Late Jurassic Salt Wash Member of the Morrison Formation are: the Henry Mountains mineral belt, and the Bitter Creek, Cat Pasture, Carcass Canyon, and Fiftymile Point areas. The evaluation of these areas was based on the presence of the following features: fluvial sandstones deposited by low-energy streams; actively subsiding synclines; paleostream transport directions approximately perpendicular to the trend of the paleofolds; presence of favorable gray lacustrine mudstone; and known uranium occurrences associated with the favorable gray mudstones. Four favorable areas identified in the Late Triassic Chinle Formation are the White Canyon-Elk Ridge, Dirty Devil-Orange Cliffs, Monument Valley, and the Greater Circle Cliffs subareas. These areas were identified as favorable on the basis of the sandstone-to-shale ratio for the Chinle Formation, and the geographic distribution of the Petrified Forest Member of the Chinle.

1687 **(PGJ/F—055-82) National Uranium Resource Evaluation: Price Quadrangle, Utah.** Campbell, J.A.; Franczyk, K.J.; Luft, S.J.; Lupe, R.D.; Peterson, F.; Robinson, K. (Geological Survey, Golden, CO (USA)). Sep 1982. Contract AI13-78GJ01686. 152p. NTIS PCE07/MF $4.40. Order Number DE82022283.

Includes 7 sheets of 24x reduction microfiche. Portions of document are illegible.

One stratigraphic sequence in one area of the Price Quadrangle, Utah has been determined to be favorable for the occurrence of uranium deposits that meet the minimum size and grade requirements of the National Uranium Resource Evaluation of the US Department of Energy. The stratigraphic sequence is the Triassic Chinle Formation, and the area is in the southeastern part of the quadrangle on the San Rafael Swell. The criteria used to determine the favorability of this area are the sandstone-to-shale ratio for the Chinle Formation, and the distribution of possible source rocks for the uranium such as the Petrified Forest Member of the Chinle. The Jurassic Twin Creek Limestone in the northwestern corner of the quadrangle in the Wasatch Mountains has been classified as unevaluated for the occurrence of uranium. All other suitable host rocks for uranium that occur in the quadrangle were judged not to meet the minimum conditions for favorability.

1688 **(PGJ/F—078-82) National Uranium Resource Evaluation: Denver Quadrangle, Colorado.** Hills, F.A.; Dickinson, K.A.; Nash, J.T.; Otton, J.K.; Dodge, H.W.; Granger, H.C.; Robinson, K.; McDonnell, J.R.; Yancey, C.L. (Geological Survey, Golden, CO (USA)). Sep 1982. Contract AI13-78GJ01686. 244p. NTIS PCE12/MF $8.75. Order Number DE83000950.

Includes 21 sheets of 24x reduction microfiche. Portions of document are illegible.

Nine areas in the Denver 1° x 2° Quadrangle, Colorado have been identified as favorable for the occurrence of uranium deposits containing a minimum of 100 tons U_3O_8 at grades of 0.01% or better. Six of these areas are in metamorphic and igneous rocks of the Front Range, one is in sedimentary rocks of South Park, and two are in sedimentary rocks of the Great Plains. Favorable areas and the classes of deposits for which they are thought to be favora-

ble are: Area A, The Foothills Favorable Environment (700 km² to a depth of 1500 m); Areas B-D, The Silver Plume Granite Favorable Environment; Area E, Southern Elkhorn Upthrust Favorable Environment; Area F, South Park Favorable Environments (27 km² in units of variable thickness); Area G, Dawson Arkose Favorable Environment (3600 km² with an estimated thickness of 50 m); and Area H, Fox Hills Formation Favorable Environment (700 km² with an estimated thickness of 38 m). Other areas and environments in the Denver Quadrangle have uranium occurences and some have yielded small amounts of uranium ore in the past (for example the Central City district). These areas are ranked as unfavorable because in our judgment the evidence does not suggest favorability for deposits of the minimum size. However, neither empirical data nor genetic models for uranium deposits are adequate presently to make determinations of favorability with confidence, and changes of rank are to be expected in the future.

1689 **(PGJ/F—079-82) National Uranium Resource Evaluation: Greeley Quadrangle, Colorado.** Hills, F.A.; Dodge, H.W. Jr.; Nash, J.T.; Granger, H.C.; Robinson, K.; McDonnell, J.R.; Day, H.C. (Geological Survey, Golden, CO (USA)). Sep 1982. Contract AI13-78GJ01686. 196p. NTIS PCE10/MF $6.80. Order Number DE82022281.

Includes 18 sheets of 24x reduction microfiche. Portions of document are illegible.

Eleven areas have been identified in the Greeley 1° x 2° Quadrangle, Colorado, that appear to be favorable for the occurrence of uranium having a minimum of 100 tons of U_3O_8 at grades of 0.01% or better. Nine of these are in the Front Range metamorphic and igneous environment, and two are in the Great Plains sedimentary environment. The two favorable areas in the Plains are underlain by the Fox Hills and Laramie Formations and are favorable for Texas roll-type (Subclass 242) and Wyoming roll-type (Subclass 241) deposits. These two favorable areas have a combined area of approximately 7000 km², and they appear to have the greatest potential for uranium ore production of all the identified favorable areas.

1690 **(PGJ/F—083-82) National Uranium Resource Evaluation: Death Valley Quadrangle, California and Nevada.** Berridge, W.C. (Bendix Field Engineering Corp., Grand Junction, CO (USA). Grand Junction Operations). Sep 1982. Contract AC13-76GJ01664. 196p. NTIS PCE08/MF $5.20. Order Number DE83000765.

Includes 10 sheets of 24x reduction microfiche. Portions of document are illegible.

The Death Valley quadrangle, California and Nevada, was evaluated for geologic environments favorable for uranium deposits in accordance with criteria developed for the National Uranium Resource Evaluation program. Reconnaissance radiometric and geochemical surveys were conducted in all geologic environments open to evaluation. Detailed surface and subsurface investigations were conducted in potential host and source environments. Subsurface data collected by private industry were obtained for all favorable environments. The results of this investigation indicate environments favorable for fluviolacustrine deposits in the Coso Formation of Tertiary age; metamorphosed lagoonal deposits in the Limekiln Spring member of the Kingston Peak Formation of late Precambrian age; and hydroallogenic and pneumatogenic deposits in Miocene rhyolites related to the Bullfrog Hills caldera. Environments in the quadrangle considered unfavorable for uranium deposits are plutonic rocks of Mesozoic age; sedimentary rocks of Precambrian, Paleozoic, Mesozoic, and Tertiary ages (other than those of the Coso Formation); volcanic rocks of Tertiary age (other than those of the Bullfrog caldera); and metamorphic rocks of Precambrian and Mesozoic ages (other than those of the Kingston Peak Formation). Substantial portions of the quadrangle remain unevaluated because of restricted access or lack of sufficient subsurface data.

1691 **(PGJ/F—093-82) National Uranium Resource Evaluation: Green Bay Quadrangle, Wisconsin.** Fitzsimonds, M.R.; Delaney, H.J.; Bogart, L.E.; Silling, R.M.; Readdy, L.A. (Golder Associates, Inc., Kirkland, WA (USA)). Sep 1982. Contract AC13-76GJ01664. 208p. NTIS PC E09/MF A01. Order Number DE83001221.

Includes 4 sheets of 24x reduction microfiche. Portions of document are illegible.

The Green Bay Quadrangle, Wisconsin, was evaluated to a depth of 1500 m (5000 ft) to identify and delineate areas favorable for the occurrence of uranium deposits. Seven uranium occurrences reported in previously published literature and two new occurrences identified during this study were located, described, and sampled. General geologic surface reconnaissance, ground radiometric measurements, and geochemical sampling were completed in all geologic environments within the quadrangle. Aerial radiometric data and hydrogeochemical and stream-sediment reconnaissance data were analyzed, and followup studies of anomalies were conducted. Potential environments were evaluated in the subsurface using descriptive logs of well cuttings. The results of this investigation suggest that several plutons within the Precambrian Y Wolf River Batholith are favorable for the occurrence of uranium deposits. Ten geologic environments appear unfavorable. Detailed evaluation of four environments was precluded because of glacial cover and lack of subsurface data defining the character of these environments at depth. These environments exhibit numerous characteristics favorabe for the occurrence of uranium but require further subsurface evaluation to adequately determine their favorability.

1692 **(PGJ/F—096-82) National Uranium Resource Evaluation: Clinton Quadrangle, Oklahoma.** Bloch, S.; Johnson, K.S.; Eutsler, R.L.; Myers, J.J. (Oklahoma Geological Survey, Norman (USA)). Sep 1982. Contract AC13-76GJ01664. 173p. NTIS PCE08/MF A01. Order Number DE83001222.

Includes 1 sheet of 24x reduction microfiche. Portions of document are illegible.

Uranium resources of the Clinton Quadrangle, west-central Oklahoma, were evaluated to a depth of 1500 m using available surface and subsurface geologic information. Uranium occurrences reported in previously published literature were located, sampled, and described in detail. Areas of anomalous radioactivity, which were interpreted from aerial radiometric and hydrogeochemical and stream-sediment reconnaissance surveys, were also investigated. Five areas of uranium favorability were delineated within the quadrangle. Delineation was based on both surface and subsurface data. Two of these areas include coastal-plain facies of the Upper Permian Doxey Shale. Two other areas include the marginal basin facies of the Cloud Chief and Rush Springs Formations (Late Permian). The fifth area, in the southern part of the quadrangle, is characterized by arkosic alluvial-fan and fluvial facies of Late Pennsylvanian and Early Permian age. Geologic units considered to be unfavorable include all pre-Upper Pennsylvanian rocks, most Permian rocks, the Pliocene Ogallala Formation, Pleistocene sediments, and parts of the Upper Pennsylvanian-Lower Permian rocks.

0504 Feed Processing

REFER ALSO TO CITATION(S) 1791

1693 **(PB—82-199159) The Recovery of uranium from phosphatic sources in relation to the E.E.C.** Derry, R. (Commission of the European Communities, Luxembourg). [nd]. 104p. NTIS PC E05/MF E05.

The recovery of uranium from phosphatic sources is reviewed in the context of the EEC. The potential and technology available for recovery from fertilizer products, furnace slag, beneficiated slimes, leached zone material, leach residues and indigenous phosphates is assessed. However, the main emphasis is on the technology available for recovery from 30 percent P2O5 phosphoric acid produced from imported phosphate rock concentrate. In particular, various solvent extraction processes now being used commercially at large scale phosphoric acid plants, mainly in North America, are discussed in detail together with research and development on solvent extraction and various other possible recovery processes. The available techniques are compared and a discussion of the economic aspects is given.

0505 Enrichment

REFER ALSO TO CITATION(S) 2181

1694 **(CNEN-RT/ING—81-19) Influence of the thermal boundary conditions on the flow and the isotope separation of a gas centrifuge.** Novelli, P. (Comitato Nazionale per l'Energia Nucleare, Casaccia (Italy). Dipartimento Ciclo del Combustibile). Nov 1981. 36p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE83900229.

Portions of document are illegible.

The axisymmetric steady gas flow in a so called thermally driven ultracentrifuge at total reflux and its $^{235}UF_6$-$^{238}UF_6$- separating characteristics are treated numerically. The top and the bottom end-caps are thermally conducting and kept at temperatures generally depending on radius. Regarding the side-wall temperature conditions, three cases will be considered: (1) insulated side-wall; (2) side-wall at constant temperature; (3) linear temperature profile continuously joining the end-plate temperatures. 20 figures, 2 tables.

0507 Fuels Production And Properties

REFER ALSO TO CITATION(S) 1795, 2626

1695 **(DP-MS—82-39) U_3O_8 from resin for powder-metallurgy fabrication of reactor fuel.** Mosley, W.C. Jr. (Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.). 1982. Contract AC09-76SR00001. 33p. (CONF-821103—28). NTIS, PC A03/MF A01. Order Number DE83000626.

From American Nuclear Society winter meeting; Washington, DC, USA (14 Nov 1982).

Portions of document are illegible.

A study was conducted to determine if cation exchange resin could be used to produce U_3O_8 powder suitable for use in powder metallurgy fabrication of fuel tubes for production reactors at the Savannah River Plant (SRP). U_3O_8 powders have been produced from three cation exchange resins: DOWEX (Dow Chemical Co.) 50W, AG (Bio-Rad Laboratories, Richmond, California) MP-50, and Bio-REX (Bio-Rad Laboratories, Richmond, California). This study included characterization of the thermal decomposition of uranium-loaded resins, measurement of properties of resin-based U_3O_8 powders, and metallographic examination of U_3O_8-Al cores in extruded fuel tubes. Results to date show that AG MP-50 appears to be the best resin for producing U_3O_8 powder suitable for the PM process. 20 figures.

1696 **(Juel—1685) Performance assessment of the $(Th,U)O_2$ HTI-Biso coated particle under PNP/HHT irradiation conditions.** Kania, M.J.; Nickel, H. (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Inst. fuer Reaktorwerkstoffe und Heisse Zellen). Nov 1980. 187p. Dep. NTIS (US Sales Only), MF A01. Order Number DE82750518.

Thesis submitted to T.H. Aachen by M.J. Kania.

The HTI Biso Particle, Variant-I: consisting of a dense 400 μm-diameter $(Th,U)O_2$-kernel with a Biso coating using a methane derived pyrocarbon layer (HTI), is a candidate fuel for the advanced PNP/HHT High Temperature Reactor systems. This report presents the results of a comprehensive performance assessment of Variant-I represented by six relevant particle batches irradiated in 12 accelerated irradiation experiments. Fuel performance was judged based upon PNP/HHT qualification requirements with regard to in-reactor operating conditions and end-of-life (EOL) coated particle failure fraction. Fuel operating conditions in each irradiation experiment were obtained from two sources: 1) a thorough review of all available irradiation data on each experiment; and 2) a two-dimensional (R,theta) thermal modeling computer code, R2KTMP, was developed to calculate fuel operating temperature distributions within spherical elements. End-of-life particle failure fractions were determined from: gaseous fission product release, based on in-reactor R/B measurements and postirradiation annealing and room temperature investigations; solid fission product release, from single particle ^{137}Cs release into fuel element matrix and hot-gaseous chlorine leaching; and visual and ceramographic examinations. Failure fractions determined by solid fission product release yielded values 2-35 times higher than those determined by gaseous fission product release.

1697 **(Juel—1738) Calculation, construction and trial of a fluidized-bed coating facility for nuclear fuels.** Schmitz, H. (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Inst. fuer Chemische Technologie). Sep 1981. 126p. (In German). NTIS (US Sales Only), PC A07/MF A01. Order Number DE82750585.

Coating layers made of pyrocarbon prevent the release of radioactive fission products from HTR fuel kernels. According to the present state of the art, coating of these fuel kernels is effected exclusively in fluidized-bed reactors. Due to the requirement of economic efficiency, an air-cooled fluidized-bed coating facility featuring an increased daily throughput, capable of processing the nuclear fuel produced during refabrication in the HTR fuel cycle, is presented in this study. A prerequisite for this improved throughput is an increase of the heavy-metal fraction to 2 kg per charge and a dimensioning of the fluidized bed to 200 mm diameter. Furthermore, a quasi-continuous operation is achieved by loading and unloading the coater at high temperatures. For the necessary new conception of such a coating facility, the individual components are calculated and designed and the overall facility tried in coating operation.

1698 **(ORNL/TM—8348) Irradiation-induced permeability in pyrocarbon coatings. Final report of work conducted under PWS FD-12.** Kania, M.J.; Thiele, B.A.; Homan, F.J. (Oak Ridge National Lab., TN (USA)). Oct 1982. Contract W-7405-ENG-26. 112p. NTIS, PC A06/MF A01. Order Number DE83001722.

Two US irradiation experiments were planned to provide information to supplement data from the German program on irradiation-induced permeability in pyrocarbon coatings. Hopefully, the data from both programs could be combined to define the onset of neutron-induced permeability in a variety of Biso coatings produced with different process variables (coating temperature, coating gases, and coating rates). The effort was not successful. None of the preirradiation characterization procedures were able to adequately predict irradiation performance. A large amount of within-batch scatter was observed in the fission gas and cesium release data along with significant within-batch variation in coating properties. Additional preirradiation characterization might result in a procedure that could successfully predict irradiation performance, but little can be done about the within-batch variation in coating properties. This variation is probably the result of random movement of particles within the coating furnace during pyrocarbon deposition. 19 figures, 4 tables.

1699 **(X-OE—91-Vol.1) Support-facility conceptual-design report for Hot Fuels Engineering Laboratory, Oak Ridge, Tennessee, Job No. 5403-7.** (Union Carbide Corp., Oak Ridge, TN (USA). Nuclear Div.; Parsons (Ralph M.) Co., Pasadena, CA (USA)). 2 Apr 1979. Contract W-7405-ENG-26;AC05-76OR01500. 271p. NTIS, PC A12/MF A01. Order Number DE83001435.

Portions of document are illegible.

This report describes the conceptual design of facility modifications required by the Hot Fuels Engineering Laboratory (HFEL). HEFL, a fuel fabrication facility, is a modification of the Thorium-Uranium Recycle Facility (TURF). This report is for the support facility only. This volume details the following: brief physical description of the project; project purpose and justification; safety, fire and health hazards; environmental impact; quality assurance; assessment of interfaces; schedules; cost estimate; and outline specifications. (DLC)

1700 **(X-OE—91-Vol.2) Support-facility conceptual-design report drawings for Hot Fuels Engineering Laboratory, Oak Ridge, Tennessee, Job No. 5403-7.** (Parsons (Ralph M.) Co., Pasadena, CA (USA)). 2 Apr 1979. Contract W-7405-ENG-26;AC05-76OR01500. 101p. NTIS, PC A06/MF A01. Order Number DE83001434.

Portions of document are illegible.

This volume consists of architectural, mechanical process, piping, mechanical specialties, environmental (HVAC), and electrical drawings for the HFEL support facility, which will be formed by a modification of the Thorium-Uranium Recycle Facility (TURF). (DLC)

1701 (INIS-mf—7127, pp 45) **CVD in nuclear energy - pyrocarbon deposition in fluidized beds.** Nickel, H. (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Inst. fuer Reaktorwerkstoffe und Heisse Zellen). [nd]. NTIS (US Sales Only), PC A04/MF A01.

From Workshop on plasma chemistry in technology; Ashkelon, Israel (30 Mar 1981).

0508 Spent Fuels Reprocessing

REFER ALSO TO CITATION(S) 1735, 1797, 1811, 1812, 2395, 2693, 2816

1702 (CONF-821056—7) **Effects of solvent-extraction contactor selection on flowsheet and facility design.** Whatley, M.E. (Oak Ridge National Lab., TN (USA)). 1982. Contract W-7405-ENG-26. 11p. NTIS, PC A02/MF A01. Order Number DE83001903.

From US/UK exchange meeting on solvent extraction technology; Oak Ridge, TN, USA (25 Oct 1982).

The notion is developed that the selection of a solvent extraction contactor is part of a more general development of principles and philosophy guiding the overall plant design. Specifically, the requirements and constraints placed on the plant by the solvent extraction system must be consistent with those imposed by the other operations, which generally are more expensive and more complicated. Were a conservative philosophy employed throughout the plant, the choice of pulsed columns seem correct. Were the plant intended to employ modern techniques and state-of-the-art technology, particularly in remote maintenance and process control, the selection of centrifugal contactors seems appropriate. The process improvements attainable from employing more stages in a more tightly controlled solvent extraction system seem marginal at present when applied to conventional flowsheets, although the cost-benefit may be attractive in a modern plant. The potential for improvement through major flowsheet modification can not presently be assessed quantitatively.

1703 (CONF-821056—8) **Review of recent ORNL studies in solvent cleanup and diluent degradation. Consolidated Fuel-Reprocessing Program.** Mailen, J.C.; Tallent, O.K. (Oak Ridge National Lab., TN (USA)). 1982. Contract W-7405-ENG-26. 35p. NTIS, PC A03/MF A01. Order Number DE83001882.

From US/UK exchange meeting on solvent extraction technology; Oak Ridge, TN, USA (25 Oct 1982).

Testing of solvent cleanup methods to replace the use of sodium carbonate in the Purex process has been ongoing for several years in order to reduce the quantity of waste sodium nitrate generated and to improve phase separation. Alternate solvent cleanup methods include the use of packed columns of base-treated silica gel or solvent scrubbing with hydrazine oxalate. Degradation of the diluent was shown to generate long-chain organic acids which appear to be the major culprits in the phase separation problems encountered in sodium carbonate scrubbers. Solvent scrubbing with hydrazine oxalate gives improved phase separations. Solvent cleanup in columns packed with base-treated silica gel avoids the phase separation problem since a dispersable aqueous phase is not present. Removals of TBP degradation products and metal-ion complexes by sodium carbonate, hydrazine salts, or by packed beds of base-treated silica gel are all satisfactory. Solvent scrubbing by hydrazine oxalate solutions is the prime candidate for solvent cleanup in fuel reprocessing plants.

1704 (CONF-821056—9) **Hot Experimental Facility reference flowsheet.** North, E.D. (Oak Ridge National Lab., TN (USA)). 1982. Contract W-7405-ENG-26. 8p. NTIS, PC A02/MF A01. Order Number DE83001920.

From US/UK exchange meeting on solvent extraction technology; Oak Ridge, TN, USA (25 Oct 1982).

Portions of document are illegible.

This paper is a useful set of background information of HEF flowsheets, although many changes have been made in the past three years. The HEF reference flowsheet is a modified high-acid PUREX flowsheet capable of operating in the coprocessing mode or with full partitioning of U and Pu. Adequate decontamination factors are provided to purify high-burnup, fast breeder-reactor fuels to levels required for recycle back to a fuel fabrication facility. Product streams are mixed U-Pu oxide and uranium oxide. No contaminated liquid wastes are intentionally discharged to the environment. All wastes are solidified and packaged for appropriate disposal. Acid and water are recovered for internal recycle. Excess water is treated and discharged from the plant stack. Several changes have been made in the reference flowsheet since that time, and these are noted briefly.

1705 (INIS-mf—7132, pp vp) **Radioactive waste processing and disposal.** Kyrs, M. 1980. (In Czech). NTIS (US Sales Only), PC A09/MF A01.

From Nuclear Research Institute scientific and technical conference; Prague, Czechoslovakia (5 Jun 1980).

The fluoride reprocessing of fast reactor fuels, the separation of selected valuable and biological emitters from radioactive wastes, and the problems of zirconium and uranium hydrometallurgy are discussed. The flow chart of the process uranium branch for spent fuel reprocessing for reactor BOR-60, developed by UJV in co-operation with Soviet institutions consists of several operations, viz., the removal of the stainless steel fuel element cladding by melting, the oxidation of UO_2 to U_3O_8, fluorination and condensation, the separation of Pu from uranium, distillation purification of UF_6, sorption-desorption purification of UF_6, waste gas treatment. The development is described of the two-stage phosphate process of radioactive waste treatment (stage one: denitration and calcination, stage two:melting). (H.S.).

1706 (Juel-Spez—130) **Chemistry and process engineering of head-ends in the reprocessing of HTGR fuel elements.** Tischer, H. (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Inst. fuer Chemische Technologie). Oct 1981. 195p. (In German). Dep. NTIS (US Sales Only), MF A01. Order Number DE82750548.

The first step in the reprocessing of HTGR fuel elements is the separation of the fuel element-graphite from the heavy metals. Several physical and chemical separation methods are presented in this report and investigated as to their suitability. If the processing aspects especially under their nuclear conditions are compared the fluidized-bed-burning is the best technical separation procedure. Since complete emission of the isotope C-14 with the offgas from an industrial plant will probably not be tolerated methods of its retention are discussed. Various fuel systems and their effects on the processing technique are presented and HEAD-END facilities, already in operation or still in the planning stage, are described.

1707 (KFK—2943) **Experimental results on the solubility of LWR UO_2/PuO_2 fuel fabricated by the earlier MOX fuel procedure.** Ochsenfeld, W.; Bleyl, H.J.; Wertenbach, H. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.)). Mar 1981. 13p. (In German). Dep. NTIS (US Sales Only), MF A01. Order Number DE82750543.

The report summarizes experimental results on dissolution of UO_2/PuO_2 LWR fuel by nitric acid. The mechanically blended fuel was fabricated by Alkem's procedure used until 1976. The examination of the fuel was done before and after irradiation, the maximum burn-up reached was 3.7 atom%. 7 to 14.5 molar nitric acid was applied during 2 to 14 hours of dissolution time. In all cases insoluble residues were found to contain more or less plutonium. The amounts of both residue and plutonium were mainly dependent on burn-up and less on the conditions of dissolution. The unirradiated fuel turned out to have the highest amounts of undissolved material: 1.0-1.2% of the fuel and 15-25% of the total plutonium. On the other hand about 0.5% of the fuel and 2-3% of the total plutonium were determined to be undissolved in dissolution experiments of the fuel with maximum burn-up. The effect of burn-up is interpreted as the result of the increased temperature of the fuel during in-core time.

1708 **(KFK—3188) Sample-bottle changer. A tool for continuous operation of automatic analytical equipment in the routine laboratory of a reprocessing facility.** Groll, P.; Augenstein, A.; Brenk, O.; Heep, W.; Radek, S.; Roeder, L. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Heisse Chemie; Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Hauptabteilung Datenverarbeitung und Instrumentierung; Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Projekt Wiederaufarbeitung und Abfallbehandlung). Sep 1981. 28p. (In German). (PWA—19/81). Dep. NTIS (US Sales Only), MF A01. Order Number DE82750201.

A sample-bottle changer for automatic supplying automatic analytical installations with samples in sample-bottles is described. In detail the principle of operation, the construction of the mechanics and the electronic control as well as the operation is described.

1709 **(KFK—3204) Concept of the chemcial engineering design of a 1000 te/y PUREX reference plant with basic data for safeguards control.** Kluth, M.; Haug, H.O.; Schmieder, H. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Heisse Chemie). Sep 1981. 23p. (In German). Dep. NTIS (US Sales Only), MF A01. Order Number DE82750185.

Some principles of the worldwide used PUREX process for reprocessing of spent nuclear fuel are described beginning from simple solvent extraction cycles. The basic chemical flow sheet is developed to the flow sheet of a large reprocessing plant. A flow sheet proposal for a 1000 tonnes per year reference plant is made, again explaining the basic ideas and principles of the plant layout e.g. uncoupling of the extraction cycles by suitable buffer volumes, arranging of Pu buffer tanks, criteria for selection of equipment, and a concept of redundancy. As a data base for safe-quards considerations, the flow sheet contains the tank concept in addition to the usual data of flow and concentration, as well as the inventory of fissile material in each apparatus or tank. In addition, the location of the sampling points necessary to run the process are illustrated and measuring and control systems for significant process flows are given.

1710 **(LA—9469-MS) Six-kilogram-scale electrorefining of plutonium metal.** Mullins, L.J.; Morgan, A.N.; Apgar, S.A. III; Christensen, D.C. (Los Alamos National Lab., NM (USA)). Sep 1982. Contract W-7405-ENG-36. 22p. NTIS, PC A02/MF A01. Order Number DE83002298.

The electrorefining of metallic plutonium scrap to produce high purity metal has been an established procedure at Los Alamos since 1964. This is a batch process and was limited to 4-kg plutonium because of criticality safety considerations. Improvements in critical mass measurements have permitted us to develop a process for 6-kg plutonium. The 6-kg process is now operational. The increased size of the process, together with other improvements which have been made, makes plutonium electrorefining the principal industrial tool for processing and purifying metallic plutonium scrap.

0509 Transport And Storage

1711 **(AD-A—111928/8) National policy implications of storing nuclear waste in the Pacific region.** Spicuzza, W.L. (National Defense Univ., Washington, DC (USA). Research Directorate). 1981. 69p. NTIS, PC A04/MF A01.

This paper analyzes a proposal to store spent nuclear fuel on Palmyra Island, a US territory nearly a thousand miles south of Hawaii. The proposal has military, political, social, and technical implications. Would the Palmyra Island storage site best support US nonproliferation objectives? What would be the reaction of US allies, especially Japan? What are the implications for Pacific residents, many of whom endured the dislocations and radiation exposure of early atomic testing? Are there environmental considerations? Who would manage and control the site? What provisions would be made for site protection?

1712 **(PNL-SA—10372) Technology, safety and costs of decommissioning reference independent spent-fuel-storage installations.** Ludwick, J.D.; Moore, E.B. (Pacific Northwest Lab., Richland, WA (USA)). Oct 1982. Contract AC06-76RL01830. 17p. (CONF-821005—15). NTIS, PC A02/MF A01. Order Number DE83002023.

From DOE international decommissioning symposium; Seattle, WA, USA (10 Oct 1982).

Safety and cost information is developed for the conceptual decommissioning of five different types of independent spent-fuel-storage installations (ISFSIs), each of which is being given consideration for long-term storage of spent nuclear fuel in the United States. These include one water basin-type ISFSI (wet) and four dry ISFSIs (drywell, silo, vault, and cask). Three decommissioning alternatives are studied to obtain comparisons between costs (in 1981 dollars), occupational radiation doses, and potential radiation doses to the public. The alternatives considered are: DECON (immediate decontamination), SAFSTOR (safe storage followed by deferred decontamination, and ENTOMB (entombment). Effects of storage size, colocation at a reactor site and elimination of fuel encapsulation upon decontamination are examined to provide potential owners with information applicable to most proposed ISFSIs. 7 tables.

1713 **(SAND—82-1417) Accident-incident history in the transportation of LLW since 1971.** Emerson, E.L.; McClure, J.D. (Sandia National Labs., Albuquerque, NM (USA)). Aug 1982. Contract AC04-76DP00789. 8p. (CONF-820919—2; TTC—0324). NTIS, PC A02/MF A01. Order Number DE82022167.

From ANS workshop on LLW packaging and shipping; San Diego, CA, USA (12 Sep 1982).

This paper provides a history of the accidents and incidents that have occurred during the transportation of Low Level Waste (LLW) in the United States during the period 1971-1981. It is based upon information in the Radioactive Material Transportation Accident/Incident Data Base developed by the Transportation Technology Center (TTC) at Sandia National Laboratories. The data base incorporates information from the Hazardous Materials Incident Report (HMIR) system operated by the Material Transportation Bureau of the U.S. Department of Transportation (DOT) with additional information obtained from the files of the U.S. Nuclear Regulatory Commission. Hazardous Material Incident Reports are acquired from the DOT on a continuing basis. This information, plus similar information acquired from the NRC, provides a radioactive material accident/incident data base which consists of 811 data entries for the time period 1971-1981.

1714 **(UCRL—88174) Spent-Fuel Test-Climax: a progress report.** Patrick, W.C.; Ballou, L.B. (Lawrence Livermore National Lab., CA (USA)). 20 Sep 1982. Contract W-7405-ENG-48. 6p. (CONF-821205—2). NTIS, PC A02/MF A01. Order Number DE83000744.

From NWTS information meeting on basalt waste isolation project; Las Vegas, NV, USA (14 Dec 1982).

Portions of document are illegible.

Both operational and technical objectives are being pursued at the Spent-Fuel Test-Climax (SFT-C). The principal operational objective is to demonstrate the safe and reliable packaging, handling, and storage of spent nuclear reactor fuel in a deep geologic media and to retrieve the fuel afterward. Packaging of the spent fuel at the Engine Maintenance, Assembly and Disassembly (EMAD) facility, initial emplacement 420m below surface in the Climax granitic stock, and three subsequent exchanges of fuel canisters between EMAD and the SFT-C has demonstrated that application of straightforward engineering practices provides a safe and highly reliable system with no significant radiation exposure to the operating personnel. The primary technical objectives of the test are simulation of the thermal effects occurring in a panel of a large repository and comparison of the relative effects on the granitic host rock of heat alone versus heat in combination with ionizing radiation. Other technical objectives direct project activities toward instrument evaluation, ventilation effects, thermal and thermomechanical response of a jointed rock mass, and computer model validation. Recent findings from field measurements and laboratory studies are briefly discussed for: performance of data acquisition

system and instrumentation; near-and intermediate-field temperature measurements; ventilation and dewpoint measurements; acoustic emission monitoring of fractures in granites; radiation-dose-to-granite measurements.

0510 Marketing And Economics

1715 **(DOE/EIA—0362) Investment in exploration by the US uranium industry.** Cohen, W. (Department of Energy, Washington, DC (USA). Energy Information Administration). Sep 1982. 61p. NTIS, PC A04/MF A01. Order Number DE83001524.

This report examines investment in domestic uranium exploration by US companies. In addition to examining the influence of typically considered variables such as expected price of output, expected cost of production, cost of capital, and reserve holdings, the analysis also considers the influence of selected attributes of the corporations involved, including cash flow, exploration expertise, and corporate investment strategy. This latter class of variables (i.e., corporate variables) has never been considered in the analysis of the determination of industry investment behavior. The sample includes observations of 25 firms' behavior over a period of 7 years, 1973 through 1979. In addition to supporting the energy Information Administration's more comprehensive uranium market modelling efforts, an interesting question this study addresses is the role of major oil companies in the uranium exploration field. The results suggest that expected profit and level of reserve holdings significantly affect exploration effort. It is also found that firms with greater cash flow and depth of in-house exploration expertise will explore more than firms with less. On the other hand, the results do not suggest that firms' diversification strategies differentiate their exploration in the short run. For instance, in the uranium industry, mineral firms do not behave differently from energy (e.g., oil) firms, once the other determinants of investment in exploration are considered. In conclusion, the results demonstrate that corporate variables should be considered in models of uranium exploration. Their consideration will enhance the ability to model exploration behavior accurately. 10 tables.

1716 **(INIS-mf—7028) Legal basis for nuclear waste disposal in Switzerland.** Egloff, V. (Cedra, Baden (Switzerland)). (International Nuclear Law Association (INLA), Brussels (Belgium)). Oct 1981. 23p. (In French). (CONF-8109120—19). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82780777.

From Nuclear International Jura '81; Palma de Mallorca, Spain (27 Sep 1981).

The legal authority for the peaceful use of nuclear energy in Switzerland is laid down in the Federal Act of 1959 on the peaceful uses of atomic energy and on protection against radiation, revised in 1978. With this revision the further development on nuclear energy has thus become dependent on fulfilment of the legal request for proof of safe and final disposal of nuclear wastes. This paper discusses in particular the obligations of nuclear waste producers in this respect.

1717 **(INIS-mf—7033) Non-proliferation and security of nuclear supply (the viewpoint of a developing country).** Alonso, G.; Tervino Botti, J.J.; Gonzalez Diaz, G. (International Nuclear Law Association (INLA), Brussels (Belgium)). Oct 1981. 10p. (In French). (CONF-8109120—34). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82780792.

From Nuclear International Jura '81; Palma de Mallorca, Spain (27 Sep 1981).

After discussing the economic, technical and political reasons underlying the slowdown in nuclear development, this paper describes the resulting problems encountered by the nuclear industry. To remedy the situation, the author suggests that in addition to measures to be adopted nationally to ensure more efficient and safer operation of nuclear installations, actions at international level should be implemented to remove obstacles to nuclear trade, bearing in mind the primary importance of non-proliferation.

1718 **(INIS-mf—7039) Contracting for nuclear fuels.** Schuessler, C.M. (NUKEM GmbH, Federal Republic of Germany). (International Nuclear Law Association (INLA), Brussels (Belgium)). Oct 1981. 20p. (CONF-8109120—17). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82780775.

From Nuclear International Jura '81; Palma de Mallorca, Spain (27 Sep 1981).

This paper deals with uranium sales contracts, i.e. with contractual arrangements in the first steps of the fuel cycle, which cover uranium production and conversion. The various types of contract are described and, where appropriate, their underlying business philosophy and their main terms and conditions. Finally, the specific common features of such contracts are reviewed.

1719 **(INIS-mf—7264) President's address.** Aspin, N. (Canadian Nuclear Association, Toronto, Ontario). Jun 1981. 10p. (CONF-8106200—13). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83780065.

From 21. annual international conference on Canadian Nuclear Association and 2. annual conference on Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

During 1980/81 the Canadian uranium industry continued to invest in new facilities. Redevelopment is taking place in Elliot Lake, and new mines are being started in Saskatchewan. Although a moratorium on uranium exploration and mining in the province of British Columbia was issued, the royal commission appointed to look into the subject stated that it saw no reason to prohibit exploration. A mood of optimism is growing in the manufacturing sector of the Canadian nuclear industry; the scarcity of orders is being offset by the excellent performance of the Ontario Hydro reactors and prospect for further construction in Ontario, Quebec and New Brunswick. The possibility of international sales of CANDU reactors is also strong. Public opinion in favour of nuclear power is growing.

0520 Waste Management

REFER ALSO TO CITATION(S) 1705, 1716, 1789, 1792, 1794, 1798, 1820, 2121, 2159, 2662, 3000, 3106, 3107, 3112, 3113, 3115

1720 **(BNL—31887) Waste form development.** Neilson, R.M. Jr.; Colombo, P. (Brookhaven National Lab., Upton, NY (USA)). 1982. Contract AC02-76CH00016. 13p. (CONF-820854—17). NTIS, PC A02/MF A01. Order Number DE83000713.

From 4. annual DOE LLWMP participant's information meeting; Denver, CO, USA (31 Aug 1982).

In this program, contemporary solidification agents are being investigated relative to their applications to major fuel cycle and non-fuel cycle low-level waste (LLW) streams. Work is being conducted to determine the range of conditions under which these solidification agents can be applied to specific LLW streams. These studies are directed primarily towards defining operating parameters for both improved solidification of problem wastes and solidification of new LLW streams generated from advanced volume reduction technologies. Work is being conducted to measure relevant waste form properties. These data will be compiled and evaluated to demonstrate compliance with waste form performance and shallow land burial acceptance criteria and transportation requirements (both as they exist and as they are modified with time). 6 tables.

1721 **(DOE/ET/40110—1) Information base for commercial radioactive-waste management.** (Mitre Corp., McLean, VA (USA). METREK Div.). Jul 1982. Contract AC01-80ET40110. 286p. NTIS, PC A13/MF A01. Order Number DE83001240.

Portions of document are illegible.

This document provides an overview of the Department of Energy's responsibilities and plans for the management of radioactive wastes generated as part of the commercial fuel cycle, as well as that from industry, research, and medical institutions of the nation. The report also highlights the federal interagency cooperation and integration of programs needed to assure a national effort to isolate existing and future radioactive wastes from the biosphere,

so that these wastes pose no significant threat to the environment or to public health and safety. This Information Base provides a status report as of December 1981, and outlines a strategy from that point and on into the future, when all of the wastes types will be safely and permanently disposed. The information provided herein is organized as follows: high-level waste; spent nuclear fuel; repository development; low-level waste; uranium mill tailings; and wastes from decommissioning and decontamination. The Department of Energy will continue to provide the commercial sector and states with the results of years of experimentation and technology development in the radioactive waste field. The Department will also continue to provide coordination and the needed information transfer, such as this Information Base, to assure that the waste management plans and programs, outlined in this document, will move forward in a timely fashion.

1722 **(DOE/ID/12348—T3) Comprehensive low-level-waste-management plan for the State of Kentucky. Fourth quarterly report for the period ending September 30, 1982.** Gregorio, S.B. (Kentucky Dept. for Natural Resources and Environmental Protection, Frankfort (USA)). 30 Sep 1982. Contract FG07-81ID12348. 17p. NTIS, PC A02/MF A01. Order Number DE83001350.

Activities for this period have included further involvement in the Midwest Regional Low Level Radioactive Waste (LLRW) compact negotiations, a coordination meeting with agencies involved in LLRW management in Kentucky, participation in a symposium in low-level waste disposal and observing a demonstration of grouting technology for LLRW burial trenches.

1723 **(DOE/NBM—3001480) Model environmental assessment for a property-cleanup/interim-storage remedial action at a formerly utilized site.** Merry-Libby, P. (Argonne National Lab., IL (USA)). Jul 1982. Contract W-31-109-ENG-38. 34p. NTIS, PC A03/MF A01. Order Number DE83001480.

This document has been prepared as a model for the preparation of an Environmental Assessment (EA) for a property-cleanup/interim-storage type of remedial action under the Formerly Utilized Sites Remedial Action Program (FUSRAP) of the US Department of Energy (DOE). For major federal actions significantly affecting the quality of the human environment, an Environmental Impact Statement (EIS) must be prepared to aid DOE in making its decision. However, when it is not clear that an action is major and the impacts are significant, an EA may be prepared to determine whether to prepare an EIS or a finding of no significant impact (FONSI). If it is likely that an action may be major and the impacts significant, it is usually more cost-effective and timely to directly prepare an EIS. If it is likely that a FONSI can be reached after some environmental assessment, as DOE believes may be the case for most property-cleanup/interim-storage remedial actions, preparation of site-specific EAs is an effective means of compliance with NEPA.

1724 **(DOE/SR-WM—83-1) Savannah River interim waste-management program plan - FY 1983.** (Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Plant). Oct 1982. Contract AC09-76SR00819. 212p. NTIS, PC A10/MF A01. Order Number DE83001695.

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This document provides the program plan as requested by the Savannah River Operations Office of the Department of Energy. The plan was developed to provide a working knowledge of the nature and extent of the interim waste management programs being undertaken by Savannah River (SR) contractors for the Fiscal Year 1983. In addition, the document projects activities for several years beyond 1983 to adequately plan for safe handling and storage of radioactive wastes generated at Savannah River and for developing technology for improved management of low-level solid wastes.

1725 **(DOE/TIC—3389) High-level radioactive wastes.** Grissom, M.C. (ed.). (Department of Energy, Oak Ridge, TN (USA). Technical Information Center). Oct 1982. 247p. D. Order Number DE82012272.

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This bibliography contains 812 citations on high-level radioactive wastes included in the Department of Energy's Energy Data Base from January 1981 through July 1982. These citations are to research reports, journal articles, books, patents, theses, and conference papers from worldwide sources. Five indexes are provided: Corporate Author, Personal Author, Subject, Contract Number, and Report Number.

1726 **(DOE/TRU—8202) Defense transuranic waste program strategy document.** (Rockwell International Corp., Golden, CO (USA). Rocky Flats Plant). Jul 1982. Contract AC04-76DP03533. 27p. (RFP—3378). NTIS, PC A03/MF A01. Order Number DE83001529.

This document summarizes the strategy for managing transuranic (TRU) wastes generated in defense and research activities regulated by the US Department of Energy. It supercedes a document issued in July 1980. In addition to showing how current strategies of the Defense Transuranic Waste Program (DTWP) are consistent with the national objective of isolating radioactive wastes from the biosphere, this document includes information about the activities of the Transuranic Lead Organization (TLO). To explain how the DTWP strategy is implemented, this document also discusses how the TLO coordinates and integrates the six separate elements of the DTWP: (1) Waste Generation Site Activities, (2) Storage Site Activities, (3) Burial Site Activities, (4) Technology Development, (5) Transportation Development, and (6) Permanent Disposal. Storage practices for TRU wastes do not pose short-term hazards to public health and safety or to the environment. Isolation of TRU wastes in a deep-mined geologic repository is considered the most promising of the waste disposal alternatives available. This assessment is supported by the DOE Record of Decision to proceed with research and development work at the Waste Isolation Pilot Plant (WIPP) in southeastern New Mexico - a deep-mined geologic research and development project. In support of the WIPP research project and the permanent disposal of TRU waste, the DTWP strategy for the near term will concentrate on completion of procedures and the design and construction of all facilities necessary to certify newly-generated (NG) and stored TRU wastes for emplacement in the WIPP. In addition, the strategy involves evaluating alternatives for disposing of some transuranic wastes by methods which may allow for on-site disposal of these wastes and yet preserve adequate margins of safety to protect public health and the environment.

1727 **(DP—1631) Coordination meeting of high-level waste technology and national waste terminal storage programs, October 21-22, 1981.** Permar, P.H. (Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.). Jan 1982. Contract AC09-76SR00001. 162p. NTIS, PC A08/MF A01. Order Number DE83001657.

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The purpose of the first National Waste Terminal Storage/High-Level Waste (NWTS/HLW) Coordination Meeting was to foster an exchange of information and to agree to a schedule of events to ensure the coordination of the two programs. Thirty-six participants, representing 11 contractors and two DOE offices, discussed the current status and planned programs under the following topics: The NWTS/HLW Coordination Schedule; Interim Performance Specifications and Data Requirements for Waste Forms; Interim Product Specifications for Defense High-Level Waste (DHLW) Forms; Description of Canistered Waste (Defense and Commercial); Reference Repository Conditions; Waste Package Conceptual Designs; Plans for Characterization of Defense and Commercial HLW Forms; Waste Package Modeling; Status of Materials Characterization Organization [Materials Characterization Center (MCC) and Materials Review Board (MRB)].

1728 **(EGG-M—07182) Microstructural analysis of SYNROC waste forms from basaltic melts.** Kelsey, P.V.; Miley, D.V. (EG and G Idaho, Inc., Idaho Falls (USA)). Jul 1982. Contract AC07-76ID01570. 18p. (CONF-820724—6). NTIS, PC A02/MF A01. Order Number DE83000538.

From 15. annual International Metallographic Society meeting; Orlando, FL, USA (18 Jul 1982).

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The fabrication of titanate/zirconate-based nuclear waste forms (SYNROC) generally requires careful blending of finely divided powders or calcines followed by an extremely sensitive hot pressing step. A simple process has been developed by which titanate/zirconate-based nuclear waste forms are synthesized from basaltic melts. The synthesized waste forms have been examined by x-ray diffraction (XRD), standard metallography, and scanning electron microscopy (SEM). The following phases were identified by SEM and XRD: pseudobrookite (Fe_2TiO_5), zirconolite ($CaZrTi_2O_7$), chevkinite ($(Ca,Ce)_4(Fe,Mg)_2Ti_3Si_4O_{22}$), and perovskite ($CaTiO_3$). Uranium, gadolinium, and cerium (fission products) ions were selectively partitioned into the crystalline zirconolite, chevkinite, and perovskite phases.

1729 **(EGG-M—18282) Institutional incinerator at University of Maryland.** Thompson, J.D. (EG and G Idaho, Inc., Idaho Falls (USA)). 1982. Contract AC07-76ID01570. 14p. (CONF-820854—13). D. Order Number DE83000158.

From 4. annual DOE LLWMP participant's information meeting; Denver, CO, USA (31 Aug 1982).

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A controlled air incinerator for low-level radioactive waste has been installed and tested at the University of Maryland, Baltimore Campus. EPA method testing indicates full compliance with environmental regulations. Licensing activities are now in progress. The State of Maryland is in the public comment period for the incinerator.

1730 **(EGG-M—18982) Waste classification system for low-level radioactive wastes.** (EG and G Idaho, Inc., Idaho Falls (USA)). 1982. Contract AC07-76ID01570. 9p. (CONF-820854—16). NTIS, MF A01. Order Number DE83000042.

From 4. annual DOE LLWMP participant's information meeting; Denver, CO, USA (31 Aug 1982).

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In this paper a new method for classifying low-level waste is introduced. The method is based on the geological hazard index introduced by Smith et al. (Smith, C.F.; Cohen, J.J.; McKone, T.E., 1980. A Hazard Index for Underground Toxic Material, UCRL-52889), and provides a measure of the total innate hazard of the waste after disposal. The classification system is designed to be a simple, cost effective and efficient waste screening tool that is conservative and applicable for the great majority of waste streams. The majority of the classification systems methodology has been developed and presented here. Three major tasks still remain to be done. First, values for the persistence of chemicals need to be developed. Second, availability factors must be derived for the ingestion of organic compounds and inhalation of volatile compounds. Third, a thorough review and evaluation of the toxic dose level methodology must be done. The waste classification index has been developed to allow some quantification of total waste hazard. The methodology has been designed to be as general as possible, so that the index would be applicable over a broad range of waste streams. The approach is intuitively simple and conservative. The waste classification index can be very useful as a measurement tool to aid in waste management decisions.

1731 **(EGG-M—19282) Proposed waste acceptance criteria for Department of Energy shallow land burial sites.** Falconer, K.L.; Grey, A.E.; Williams, H.D. (EG and G Idaho, Inc., Idaho Falls (USA)). 1982. Contract AC07-76ID01570. 4p. (CONF-820854—14). NTIS, PC A02/MF A01. Order Number DE83000041.

From 4. annual DOE LLWMP participant's information meeting; Denver, CO, USA (31 Aug 1982).

Waste acceptance criteria were developed as part of an overall effort to establish general criteria for the shallow land burial of Department of Energy low-level radioactive waste. Other areas of criteria development include site selection, design, operations, closure/post-closure, corrective measures and quality assurance. All the criteria are based on a concept of low-level waste management which recognizes the use of system performance objectives. Waste acceptance criteria are standard rules by which the acceptability of a low-level waste package at a given shallow land burial facility can be judged.

1732 **(EGG-M—19482) EPICOR-II research and disposition program at the INEL.** Reno, H.W.; Dodge, R.L. (Idaho National Engineering Lab., Idaho Falls (USA)). 13 Sep 1982. Contract AC07-76ID01570. 15p. (CONF-820919—3). NTIS, PC A02/MF A01. Order Number DE83001352.

From ANS workshop on LLW packaging and shipping; San Diego, CA, USA (12 Sep 1982).

Among the radioactive wastes produced during the cleanup of Unit 2 of the Three Mile Island (TMI) Nuclear Power Station were 50 EPICOR-II liners, used to remove activation products from contaminated water. The EPICOR-II liners are being sent to the Idaho National Engineering Laboratory where they will be stored in special facilities, researched as special wastes, placed in High-Integrity Containers, and disposed offsite at a commercial low-level waste facility. Research efforts include (1) developing a High-Integrity Container, (2) disposing of a liner in a High-Integrity Container on a best-effort basis, (3) examining EPICOR-II liners to determine their integrity, (4) solidifying EPICOR-II resins in cement and synthetic polymer, (5) testing solidified EPICOR-II resins for compressibility and leachability, (6) determining the degradation of EPICOR-II resins, and (7) investigating the behavior of solidified EPICOR-II resin samples in a soil environment (lysimeter test).

1733 **(EGG-M—20282) Characteristics of fuel cycle waste.** Aquilina, C.A.; Everette, S.E. (EG and G Idaho, Inc., Idaho Falls (USA)). 1982. Contract AC07-76ID01570. 5p. (CONF-820854—15). NTIS, PC A02/MF A01. Order Number DE83000040.

From 4. annual DOE LLWMP participant's information meeting; Denver, CO, USA (31 Aug 1982).

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The Low-Level Waste Management System started in 1979 to describe and model the existing commercial low-level waste management system. The system description produced is based on the identification of the different elements making up both the fuel and non-fuel cycle and their relationships to each other. A systems model based on the system description can accurately reflect the flow of low-level waste from generator to disposal site and is only limited by the reliability of the information it uses. For both the fuel cycle and non-fuel cycle large quantities of information is required in order to allow the system to operate at its full potential. Work is ongoing to collect this information. Significant progress is being made in the fuel cycle area primarily because the majority of fuel cycle low-level radioactive waste is produced by commercial power reactor plant operations. The Low-Level Waste Management system is only beginning to derive the benefits to be obtained from an accurate low-level waste management information system. As data is verified and analyzed, results on a national as well as individual organization level will be gained. Comparisons to previous studies will be made. Accurate projections of waste volumes and activities to be produced, projected impacts of waste streams of treatment or management changes are only examples of information to be produced. 1 figure, 1 table.

1734 **(ENICO—1120) Properties of Formula 127 glass prepared with radioactive zirconia calcine.** Staples, B.A.; Pavlica, D.A.; Cole, H.S. (Exxon Nuclear Idaho Co., Inc., Idaho Falls (USA)). Sep 1982. Contract AC07-79ID01675. 52p. NTIS, PC A04/MF A01. Order Number DE83000790.

Formula 127 glass has been developed to immobilize ICPP zirconia calcine. This glass has been prepared remotely on a laboratory scale basis with actual radioactive zirconia calcine retrieved after ten years of storage from Bin Set 2. The aqueous leachability of the glass produced was investigated and compared through application of the MCC-1, MCC-2 and Soxhlet leach tests with that of Formula 127 glass prepared with simulated calcine. The solid state properties of the glasses prepared with actual and simulated calcines were also measured by electron spectroscopy for chemical analysis (ESCA) and scanning electron microscopy energy dispersive x-ray (SEM-EDX). Based on the application of these leaching tests and analysis techniques the properties measured in this study are similar for 127 glass prepared with either simulated or radioactive calcine. 13 figures, 16 tables.

1735 **(GA-A—16852) Evaluation of NO/sub x/ scrubber for dissolver off-gas streams.** Hostbjor, G.J.; Higuchi, K. (General Atomic Co., San Diego, CA (USA)). Sep 1982. Contract AT03-76SF71053. 25p. NTIS, PC A02/MF A01. Order Number DE83001912.

A nitrogen oxides (NO/sub x) scrubber made by Croll-Reynolds Company was evaluated for use in removing NO/sub x/ from dissolver off-gas. Six tests of the unit were made by dissolving finely divided U_3O_8 in 2.5-M nitric acid and analyzing the NO/sub x/ concentration of the gas stream at the scrubber inlet and outlet. Two tests used NO gas flow through the dissolver vessel to simulate dissolver off-gas. Scrubber efficiency ranged from 46% to 89%. 10 figures, 1 table.

1736 **(GSF-T—117) Basic aspects of the geology of ASSE.** Klarr, K. (Gesellschaft fuer Strahlen- und Umweltforschung m.b.H. Muenchen, Remlingen (Germany, F.R.). Inst. fuer Tieflagerung). Mar 1981. 98p. (In German). Dep. NTIS (US Sales Only), MF A01. Order Number DE82750216.

The geological fundamentals of the Asse mine are presented which are always cited whenever the suitability of Asse as a final storage site is discussed.

1737 **(INIS-mf—7156) Ordinance on measures for preparation of a radioactive waste repository (Ordinance on preparatory measures) of 24 October 1979.** 24 Oct 1981. 7p. (In French). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83780019.

This Ordinance contains details concerning the special procedure provided for under Section 10(2) of the Federal Order of 6th October 1978 concerning the Atomic Energy Act whereby the Federal Council must grant permission before preparations for the construction of radioactive waste repositories may be undertaken. The Ordinance defines the preparatory measures, which include maps and plans of the area, a geological report, etc. (NEA).

1738 **(INIS-mf—7158) Ruling of the Administrative Court of the Council of State of the Netherlands concerning the Appeal Lodged by Certain Environmental Protection Organizations (7th August 1981).** Dec 1981. 3p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83780020.

In June 1981, a Joint Dutch-Belgian-Swiss radioactive waste disposal operation into the Atlantic was scheduled to take place under the NEA Multilateral Consultation and Surveillance Mechanism for Sea Dumping of Radioactive Waste. The operation was suspended because, on the basis of the 1979 Environmental Protection (General Provisions) Act of the Netherlands, certain environmental protection organizations lodged an appeal against the licence for this operation before the Netherlands Administrative Court of the Council of State, which decided to suspend the operation before deciding on the merits of the case. On 7 August 1981, the Court dismissed the appeal in this Ruling. (NEA).

1739 **(INIS-mf—7276) Review of the nuclear fuel waste management program.** Hatcher, S.R. (Atomic Energy of Canada Ltd., Pinawa, Manitoba. Whiteshell Nuclear Research Establishment). Jun 1981. 7p. (CONF-8106200—11). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83780063.

From 21. annual international conference on Canadian Nuclear Association and 2. annual conference on Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

The Canadian research program to investigate the disposal of nuclear fuel waste is well established with participation from a wide cross section of the scientific and engineering community. Some phases of the program have not proceeded at the pace originally envisaged. Nevertheless, significant progress has been made. The resources available and difficulties in obtaining approval for additional field research areas have restricted geotechnical research to granite formations. With the prospect of increased levels of funding and new initiatives for approvals for field research, it is expected that the program will proceed on a broader front.

1740 **(INIS-mf—7277) Research requirements for long-term management of uranium mine wastes.** Joe, E.G. (Department of Energy, Mines and Resources, Ottawa, Ontario (Canada)); Lapp, P.A. (Lapp (Philip A.) Ltd., Toronto, Ontario (Canada)). Jun 1981. 15p. (CONF-8106200—12). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83780064.

From 21. annual international conference on Canadian Nuclear Association and 2. annual conference on Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

At present there are more than 100 million tonnes of uranium tailings on the surface in Canada. While approximately one third of the tailings piles are inactive, most are under continual management. However, approximately 6 million tonnes are in abandoned tailings piles. It is not now permissible to decommission a uranium tailings waste management area after the mill is shut down because the environmental consequences are not yet fully understood. In order to review present activities and plan a research program on the management of uranium mill waste, the National Technical Planning Group on Uranium Tailings Research was formed in 1980. Sponsored by the Canada Centre for Mineral and Energy Technology (CANMET), the group consisted of representatives from the federal and provincial governments (Ontario, Saskatchewan, and Newfoundland), regulatory agencies, the uranium producers, and research organizations. The group proposed a research program consisting of three interactive parts: a modelling program, a national measurement program, and a disposal technologies program. It is expected that the national uranium tailings research program may require more than a decade for its completion. However, the proposed program covers an initial period of three years, at the end of which there should be a major review.

1741 **(KFK—3167) Function TTR for separation-columns.** Hauss, E. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Hauptabteilung Ingenieurtechnik; Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Projekt Wiederaufarbeitung und Abfallbehandlung). Jun 1981. 43p. (In German). Dep. NTIS (US Sales Only), MF A01. Order Number DE82750533.

A cascade function is used to compute a family of characteristic curves for two and three operating plates to be used for the separation problems involved in Kr removal, the diagram indicates the possibilities and limits of design. The design proposed in a calculation given as an example is correct also if the top product of a downstream separation column is returned as feed to the first column. The data used and the computation steps are indicated, the application of the functions is explained by an example. As a useful design for Kr separation, a first separation column with 14 plates is proposed, which has two operating plates in the stripping section. The results of this calculation are tabulated. The bottoms are withdrawn as gases, the design reflux value is 1.25. A relative comparison of various practical types of plates is made for design purposes.

1742 **(KFK—3222) Decay calculations on medium-level and actinide-containing wastes from the LWR fuel cycle. Pt. 2.** Haug, H.O. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.)). Dec 1981. 101p. (In German). Dep. NTIS (US Sales Only), MF A01. Order Number DE82750564.

1. The radiotoxicity index as inherent property of the radionuclide inventory was calculated for medium-level and actinide-containing wastes. The calculations were based on the annual limits of intake of the German Radiation Protection Ordinance as well as the new values of annual limits of intake from ICRP-30. The latter imply a higher rating of the toxicity of transuranium nuclides and a lower rating of Sr-90, Tc-99, and Ra-226. Thus, the annual radiotoxicity index is controlled by the transuranics after 10 to 100 years. 2. From the comparison of the radiotoxicity index of conditional and packed wastes with the same volume of uranium ore, it was evaluated that the relative radiotoxicity of the medium-level wastes decreases below the level of pitchblende after less than 100 years and below a 3% uranium ore after less than 2000 of decay. However, based on ICRP-30, the relative radiotoxicity index decreases below the level of pitchblende after 1000 years and decays to the level of the 3% uranium ore at about 10^5 years. 3. The comparison of the radiotoxicity concentration of the total disposal layer with a

uranium ore deposit shows that the radiotoxicity concentration based on ICRP-30 of the self-heating wastes placed in single boreholes decays within 2000 years (high level waste within 3000 years) below the level of a uranium ore deposit of 0.2% uranium. The radiotoxicity concentration of the medium-level process waste and the alpha-waste disposed off in disposal chambers decreases to the level of a uranium ore deposit with 0.4 to 6% uranium after about 10^4 years, and 1% after about 10^6 years.

1743 **(MLM—2997-OP) Detritiation of low-level aqueous waste by Combined Electrolysis Catalytic Exchange.** Rogers, M.L. (Monsanto Research Corp., Miamisburg, OH (USA). Mound Facility). 1982. Contract AC04-76DP00053. 20p. (CONF-821106—8). NTIS, PC A02/MF A01. Order Number DE82021323.

From Annual meeting of heat transfer and energy conversion; Los Angeles, CA, USA (14 Nov 1982).

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The Combined Electrolysis Catalytic Exchange (CECE) technology is, at present, the only viable means for removing tritium from low level aqueous waste. The CECE process will be described and the results of experimentation at Mound will be discussed. Several specific low level applications that might benefit from this technology will be outlined. 4 figures, 1 table.

1744 **(MLM—3017(OP)) Effects of various calcined ash and sludge waste loadings on the durability of a soda-lime-silica glass.** Kramer, D.P.; Lewis, E.L.; Armstrong, K.M.; Doty, J.W. (Mound Facility, Miamisburg, OH (USA)). 1982. Contract AC04-76DP00053. 3p. (CONF-821122—1). NTIS, PC A02/MF A01. Order Number DE83001537.

From Conference on glass and ceramic materials; Oak Ridge, TN, USA (8 Nov 1982).

A commercially available joule-heated glass furnace system is currently being evaluated at Mound as a means of reducing the volume of low-level radioactive waste similar to that found in light water reactor facilities. The furnace utilizes molten soda-lime-silica to initiate and support combustion of the waste feed and to serve as an immobilization matrix. First, corrosion studies were performed to determine the result that various waste loadings of glass would have on the refractory lining the furnace. Second, the chemical durability of soda-lime-silica under various waste loadings was assessed to determine its resistance to leaching under conditions similar to those encountered at waste disposal sites. Results proved that, although corrosion was quite significant for pure soda-lime-silica and a 10% waste loading, by the time a waste loading of 40% was achieved, the effects of corrosion were virtually nil. The temperature dependence of the corrosion caused by a 0% waste loading of soda-lime-silica on the refractory was also investigated. With an increase in temperature to 2650°F, corrosion more than tripled. As a result, incineration and idle temperature is being maintained at, or below, 2400°F. In conclusion, from the fact that the higher waste loading of soda-lime glass produced both increased chemical durability and increased refractory life, waste loadings in excess of 40%, and as high as 80%, may be achieved without adverse effect to the glass furnace system or its effectiveness for immobilizing radioactive waste.

1745 **(NUREG—0902) Site suitability, selection and characterization: Branch technical position--Low-Level Waste Licensing Branch.** Siefken, D.; Pangburn, G.; Pennifill, R.; Starmer, R.J. (Nuclear Regulatory Commission, Washington, DC (USA)). Apr 1982. 31p. NTIS, PC A03/MF A01.

The staff provides an expanded interpretation of the site suitability requirements in the proposed rule 10 CFR Part 61, a description of the anticipated site selection process, and a detailed discussion of the site characterization program needed to support a license application and environmental report. The paper provides early-on guidance to prospective applicants in these three subject areas.

1746 **(NUREG/CR—2478-V1) Study of trench covers to minimize infiltration at waste disposal sites. Task 1 report: review of present practices and annotated bibliography. Technical report, 1 Oct 80-30 Sep 81.** Herzog, B.L.; Cartwright, K.; Johnson, T.M.; Harris, H.J.H. (Illinois State Geological Survey, Urbana (USA)). Mar 1982. 253p. NTIS, PC A12/MF A01.

Failure of current trench covers in the humid eastern portion of the United States to prevent tritium and other radionuclide migration has prompted research into methods of reducing infiltration by modified trench covers. This report includes a discussion of present practices and a review of the relevant scientific literature. The main types of covers suggested are thicker clay covers of the current design, rigid and nonrigid man-made covers, covers employing clay sealants and covers using the wick effect. The two latter concepts are argued to offer the best long-term solution to the problem with the least maintenance. Optimal designs for clay and the wick effect have been proposed by SCS (1978) and Dragonette et al. (1979).

1747 **(NUREG/CR—2547) Evaluation of geotechnical surveillance techniques for monitoring high-level waste repository performance. Final report 19 Sep 81-31 Dec 82.** St. John, C.M.; Aggson, J.R.; Hardy, M.P.; Hocking, G. (Agapito (J.F.T.) and Associates, Grand Junction, CO (USA)). Mar 1982. 382p. NTIS, PC A17/MF A01.

This report recommends geotechnical monitoring programs for evaluation of high-level nuclear waste repository performance. It is based upon assessments of conditions and responses of the geologic media to the site of a repository. The state of technology in geotechnical monitoring was reviewed for applicability to repository monitoring. The recommended geotechnical monitoring program utilizes existing geotechnical instrumentation. The proposed activities are delineated in each phase of repository development: the proposed monitoring is detailed for various dimensional scales. Only geotechnical instrumentation presently available or easily within the state of the art is considered and it was concluded that it is possible to define an integrated geotechnical monitoring program that would meet the proposed licensing requirements.

1748 **(NVO—250) Overview of energy and mineral resources for the Nevada nuclear-waste-storage investigations, Nevada Test Site, Nye County, Nevada.** Bell, E.J.; Larson, L.T. (Department of Energy, Las Vegas, NV (USA). Nevada Operations Office). Sep 1982. 73p. NTIS, PC A04/MF A01. Order Number DE83001418.

This report was prepared for US Department of Energy as part of the Environmental Area Characterization for the Nevada Nuclear Waste Storage Investigations (NNWSI) at the Nevada Test Site (NTS). The characterization addresses energy resources including hydrocarbons, geothermal and radioactive fuel materials, mineral resources including base and precious metals and associated minerals, and industrial minerals and rock materials which occur in the vicinity of the NNWSI area. A generalized commentary is provided on past and present mining and exploration activity, with discussions of resource potential in a context of the regional resource base and projected future demands for these resources. The purpose of the study was to document known energy and mineral resources, to identify areas of potential resources, and to delineate areas for which additional data should be obtained if a site is to be developed for high-level radioactive waste storage in the vicinity of the southwest part of the Nevada Test Site. The characterization of energy and mineral resources will be integrated by Sandia National Laboratory (SNL) personnel with a variety of other studies to develop an Environmental Area Characterization report and to plan environmental analyses as well as further resource analyses.

1749 **(ONWI—202) Longevity of borehole and shaft sealing materials: characterization of cement-based ancient building materials.** Roy, D.M.; Langton, C.A. (Pennsylvania State Univ., University Park (USA). Materials Research Lab.). Sep 1982. Contract AC06-76RL01830. 124p. NTIS, PC A06/MF A01. Order Number DE83000730.

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Durability and long-term stability of cements, mortars, and/or concretes utilized as borehole plugging and shaft sealing materials are of present concern in the national effort to isolate and contain nuclear waste within deep geological repositories. The present study consists of a preliminary examination of selected ancient, old, and modern building materials (14 specimens) and was intended to document and explain the remarkable durability of these portland cement-related materials. This study has provided insights into reasons for the durability of certain structures and also into the long-term stability of calcium silicate binders (cements) used in archaeologic materials. These data were combined with knowledge obtained from the behavior of modern portland cements and natural materials to evaluate the potential for longevity of such materials in a borehole environment. A multimethod analysis was used and included: macroscopic and microscopic (petrographic and SEM) analyses, chemical analyses, and x-ray diffraction analyses. 61 figures, 11 tables.

1750 **(ORNL/TM—8372) Efficacy of backfilling and other engineered barriers in a radioactive waste repository in salt.** Claiborne, H.C. (Oak Ridge National Lab., TN (USA)). Sep 1982. Contract W-7405-ENG-26. 34p. NTIS, PC A03/MF A01. Order Number DE83000380.

In the United States, investigation of potential host geologic formations was expanded in 1975 to include hard rocks. Potential groundwater intrusion is leading to very conservative and expensive waste package designs. Recent studies have concluded that incentives for engineered barriers and 1000-year canisters probably do not exist for reasonable breach scenarios. The assumption that multibarriers will significantly increase the safety margin is also questioned. Use of a bentonite backfill for surrounding a canister of exotic materials was developed in Sweden and is being considered in the US. The expectation that bentonite will remain essentially unchanged for hundreds of years for US repository designs may be unrealistic. In addition, thick bentonite backfills will increase the canister surface temperature and add much more water around the canister. The use of desiccant materials, such as CaO or MgO, for backfilling seems to be a better method of protecting the canister. An argument can also be made for not using backfill material in salt repositories since the 30-cm-thick space will provide for hole closure for many years and will promote heat transfer via natural convection. It is concluded that expensive safety systems are being considered for repository designs that do not necessarily increase the safety margin. It is recommended that the safety systems for waste repositories in different geologic media be addressed individually and that cost-benefit analyses be performed.

1751 **(PNL—4254) Transuranic advanced disposal systems: preliminary ^{239}Pu waste-disposal criteria for Hanford.** Kennedy, W.E. Jr.; Aaberg, R.L.; Napier, B.A.; Soldat, J.K. (Pacific Northwest Lab., Richland, WA (USA)). Sep 1982. Contract AC06-76RL01830. 47p. NTIS, PC A03/MF A01. Order Number DE83001732.

This report contains the draft results of a study sponsored by the US Department of Energy (DOE) to determine preliminary ^{239}Pu waste disposal criteria for the Hanford Site. The purpose of this study is to provide a preliminary evaluation of the feasibility of various defense TRU advanced disposal options at the Hanford Site. Advanced waste disposal options include those developed to provide greater confinement than provided by shallow-land burial. They will be used to complement the waste geologic disposal in achieving permanent disposal of selected TRU wastes. An example systems analysis is discussed with assumed performance objectives and Hanford-specific disposal conditions, waste forms, site characteristics, and engineered barriers. Preliminary waste disposal criteria for ^{239}Pu are determined by applying the Allowable Residual Contamination Level (ARCL) method. This method is based on compliance with a radiation dose rate limit through a site-specific analysis of the potential for radiation exposure to individuals. A 10,000-year environmental performance period is assumed, and the dose rate limit for human intrusion is assumed to be 500 mrem/yr to any exposed individual. Preliminary waste disposal criteria derived by this method for ^{239}Pu in soils at the Hanford Site are: 0.5 nCi/g in soils between the surface and a depth of 1 m, 2200 nCi/g of soil at a depth of 5 m, and 10,000 nCi/g of soil at depths 10 m and below. These waste disposal criteria are based on exposure scenarios that reflect the dependence of exposure versus burial depth. 5 figures, 7 tables.

1752 **(PNL—4366) Defense-waste vitrification studies during FY-1981. Summary report.** Bjorklund, W.J. (comp.). (Pacific Northwest Lab., Richland, WA (USA)). Sep 1982. Contract AC06-76RL01830. 147p. NTIS, PC A07/MF A01. Order Number DE83001692.

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Both simulated alkaline defense wastes and simulated acidic defense wastes (formed by treating alkaline waste with formic acid) were successfully vitrified in direct liquid-fed melter experiments. The vitrification process was improved while using the formate-treated waste. Leach resistance was essentially the same. Off-gas entrainment was the primary mechanism for material exiting the melter. When formate waste was vitrified, the flow behavior of the off gas from the melter changed dramatically from an erratic surging behavior to a more quiet, even flow. Hydrogen and CO were detectable while processing formate feed; however, levels exceeding the flamability limits in air were never approached. Two types of melter operation were tested during the year, one involving boost power. Several boosting methods located within the melter plenum were tested. When lid heating was being used, water spray cooling in the off gas was required. Countercurrent spray cooling was more effective than cocurrent spray cooling. Materials of construction for the off-gas system were examined. Inconel-690 is preferred in the plenum area. Inspection of the pilot-scale melter found that corrosion of the K-3 refractory and Inconel-690 electrodes was minimal. An overheating incident occurred with the LFCM in which glass temperatures up to 1480°C were experienced. Lab-scale vitrification tests to study mercury behavior were also completed this year. 53 figures, 63 tables.

1753 **(PNL—4428-Vol.1) Comparative assessment of TRU waste forms and processes. Volume I. Waste form and process evaluations.** Ross, W.A.; Lokken, R.O.; May, R.P.; Roberts, F.P.; Timmerman, C.L.; Treat, R.L.; Westsik, J.H. Jr. (Pacific Northwest Lab., Richland, WA (USA)). Sep 1982. Contract AC06-76RL01830. 53p. NTIS, PC A04/MF A01. Order Number DE83000925.

This study provides an assesses seven waste forms and eight processes for immobilizing transuranic (TRU) wastes. The waste forms considered are cast cement, cold-pressed cement, FUETAP (formed under elevated temperature and pressure) cement, borosilicate glass, aluminosilicate glass, basalt glass-ceramic, and cold-pressed and sintered silicate ceramic. The waste-immobilization processes considered are in-can glass melting, joule-heated glass melting, glass marble forming, cement casting, cement cold-pressing, FUETAP cement processing, ceramic cold-pressing and sintering, basalt glass-ceramic processing. Properties considered included gas generation, chemical durability, mechanical strength, thermal stability, and radiation stability. The ceramic products demonstrated the best properties, except for plutonium release during leaching. The glass and ceramic products had similar properties. The cement products generally had poorer properties than the other forms, except for plutonium release during leaching. Calculations of the Pu release indicated that the waste forms met the proposed NRC release rate limit of 1 part in 10^5 per year in most test conditions. The cast-cement process had the lowest processing cost, followed closely by the cold-pressed and FUETAP cement processes. Joule-heated glass melting had the lower cost of the glass processes. In-can melting in a high-quality canister had the highest cost, and cold-pressed and sintered ceramic the second highest. Labor and canister costs for in-can melting were identified. The major contributor to costs of disposing of TRU wastes in a defense waste repository is waste processing costs. Repository costs could become the dominant cost for disposing of TRU wastes in a commercial repository. It is recommended that cast and FUETAP cement and borosilicate glass waste-form systems be considered. 13 figures, 16 tables.

1754 **(PNL—4428-Vol.2) Comparative assessment of TRU waste forms and processes. Volume II. Waste form data, process descriptions, and costs.** Ross, W.A.; Lokken, R.O.; May, R.P.; Roberts, F.P.; Thornhill, R.E.; Timmerman, C.L.; Treat, R.L.; Westsik, J.H. Jr. (Pacific Northwest Lab., Richland, WA (USA)). Sep 1982. Contract AC06-76RL01830. 204p. NTIS, PC A10/MF A01. Order Number DE83001805.

This volume contains supporting information for the comparative assessment of the transuranic waste forms and processes summarized in Volume I. Detailed data on the characterization of the waste forms selected for the assessment, process descriptions, and cost information are provided. The purpose of this volume is to provide additional information that may be useful when using the data in Volume I and to provide greater detail on particular waste forms and processes. Volume II is divided into two sections and two appendixes. The first section provides information on the preparation of the waste form specimens used in this study and additional characterization data in support of that in Volume I. The second section includes detailed process descriptions for the eight processes evaluated. Appendix A lists the results of MCC-1 leach test and Appendix B lists additional cost data. 56 figures, 12 tables.

1755 **(PNL-SA—10290) Off-gas characteristics of liquid-fed joule-heated ceramic melters.** Goles, R.W.; Sevigny, G.J. (Pacific Northwest Lab., Richland, WA (USA)). Jun 1982. Contract AC06-76RL01830. 30p. (CONF-820833—15). NTIS, PC A03/MF A01. Order Number DE83002072.

From 17. DOE nuclear air cleaning conference; Denver, CO, USA (1 Aug 1982).

The off-gas characteristics of liquid-fed joule-heated ceramic melters have been investigated as a function of melter operational condition and simulated waste feed composition. The results of these studies have established the identity and behavior patterns of gaseous emissions, the characteristics of melter-generated aerosols, the nature and magnitude of melter effluent losses and the factors affecting melter operational performance. 8 figures, 16 tables.

1756 **(PNL-SA—10295) Assessment of effectiveness of Geologic Isolation Systems. The development and application of a geologic simulation model.** Foley, M.G.; Petrie, G.M. (Pacific Northwest Lab., Richland, WA (USA)). Mar 1982. Contract AC06-76RL01830. 11p. (CONF-820810—14). NTIS, PC A02/MF A01. Order Number DE83002015.

From 10. international mathematics and computers simulation congress on systems simulation and scientific computation; Montreal, Canada (9 Aug 1982).

The Geologic Simulation Model (GSM) developed under the Assessment of Effectiveness of Geologic Isolation Systems (AEGIS) project at the Pacific Northwest Laboratory for the Department of Energy is a quasi-deterministic process-response model which simulates the development of the geologic and hydrologic systems of a ground-water basin for a million years into the future. Effects of natural processes on the ground-water hydrologic system are modeled principally by rate equations. The combined effects and synergistic interactions of different processes are approximated by linear superposition of their effects during discrete time intervals in a stepwise-integration approach. The completed AEGIS GSM was used to generate 500 Monte Carlo simulations of the behavior of the geologic/hydrologic system affecting a hypothetical repository in the Pasco Basin over the next million years. These simulations used data which were not subjected to a review adequate to the needs of a real site performance assessment. However, the general care used in generating the data, and the overall behavior of the GSM suggest that the results are plausible at this time.

1757 **(PNL-SA—10700) Summary of the unsaturated hydrologic flow and transport project conducted for NRC.** Nelson, R.W. (Pacific Northwest Lab., Richland, WA (USA)). Aug 1982. Contract AC06-76RL01830. 7p. (CONF-820854—18). NTIS, PC A02/MF A01. Order Number DE83002038.

From 4. annual DOE LLWMP participant's information meeting; Denver, CO, USA (31 Aug 1982).

The objective of this technical assistance project sponsored by NRC was to summarize the present state-of-the-art for unsaturated flow and transport modeling. It involved two primary efforts: (1) preparing an indepth summary and evaluation of available unsaturated flow and transport models potentially useful to NRC; and (2) organizing and convening a symposium on unsaturated modeling to elucidate the present strengths and weaknesses in unsaturated flow and transport analysis. The combination of model reviews and symposium discussion was designed to consider the present state-of-the-art in unsaturated modeling as part of a continuum of the past, present, and needed future developments in partially saturated flow and transport technology. The emphasis of this effort was on providing assessment capability to evaluate low-level waste management alternatives and disposal facilities. The two phases of this technical assistance project for NRC are essentially complete and further work under this specific study is not expected to extend beyond the current fiscal year. The model review and summary results are presented in a technical report by C.A. Oster (1) which was submitted to NRC for review and publication. The symposium proceedings have been submitted for publication and will be released this month (2). These two extensive documents are only summarized here and one pertinent transport issue considered in a cursory way as an important point of discussion of the symposium proceedings.

1758 **(PNL-SA—10701) Relevance of biotic pathways to the regulation of nuclear waste disposal.** Kennedy, W.E. Jr.; McKenzie, D.H.; Cadwell, L.L. (Pacific Northwest Lab., Richland, WA (USA)). Sep 1982. Contract AC06-76RL01830. 10p. (CONF-820854—19). NTIS, PC A02/MF A01. Order Number DE83002044.

From 4. annual DOE LLWMP participant's information meeting; Denver, CO, USA (31 Aug 1982).

Alternatives for licensing and regulating low-level waste burial sites need to be selected on the basis of reasonable evaluations of risk. With regard to low-level sites, biotic transport processes must be evaluated along with other transport processes (e.g. groundwater, agricultural food chains) if the consequences of alternative courses of action are to be understood. Biotic transport (amounts and rates or radionuclide transport by biota) at waste facilities is poorly understood when compared to current understanding of routes and movements of radionuclides through agricultural food chains. This presentation includes work on Phase I of this research program conducted for the US Nuclear Regulatory Commission (1). Our objective was to assess current biotic transport modeling. Our efforts have focused on evaluating the relevance of biotic transport to the assessment of impacts of waste disposal on humans and their environment. Our assessment considered available dose pathway analysis computer models and the potential applications of biotic transport models at low-level waste (LLW) disposal sites. An identification and review of biotic transport mechanisms and processes for terrestrial systems was provided. Current efforts are to estimate the comparative magnitude of dose to man resulting from biotic transport. The final report for Phase I will contain: (1) a critical review of available modeling techniques; (2) an assessment of the possible significance of biotic transport of radionuclides from low-level waste disposal sites to man; and (3) if appropriate, a summary of additional investigations needed to apply biotic transport modeling to regulatory concerns effectively.

1759 **(PTB-FMRB—86) SALTMP - a FORTRAN program for fast salt temperature calculations in HRW final storage.** Ramthun, H. (Physikalisch-Technische Bundesanstalt, Braunschweig (Germany, F.R.). Forschungs- und Messreaktor). Jul 1981. 17p. (In German). Dep. NTIS (US Sales Only), MF A01. Order Number DE82750525.

The computer code SALTMP is the transformation of Calculations concerning the temperature increase in salt rock for a given concept of waste disposal into a FORTRAN program. It starts from an analytical solution of the heat conduction diffential equation and requires relatively short computing times. The disadvantage of less flexibility (assumption of an idealized model, of constant heat production and of temperature independent heat conductivity in salt rock) is compensated for by additional approximation calculations. As a consequence detailed temperature curves are obtained in a fraction of one hour also when long distances or long disposal times are requested and when numerical procedures fail because of too long computing times. As an example the task was

chosen to evaluate the temperature curves for four disposal times, the loci for the calculation being given by a set of 48 coordinates in the median plane of the disposal and by a special choice of the routine, computing the distances from the 54 disposal positions. As in this case the way of computing is crossing three areas of heat production, each curve is subdivided into three sections, sparing these areas. This makes evident, that within the framework of these calculations the temperatures in the disposal positions remain undefined.

1760 **(PTB-FMRB—88) Radiant energy dissipation during final storage of high-level radioactive waste in rock salt.** Ramthun, H. (Physikalisch-Technische Bundesanstalt, Braunschweig (Germany, F.R.). Forschungs- und Messreaktor). Aug 1981. 34p. (In German). Dep. NTIS (US Sales Only), MF A01. Order Number DE82750523.

A final disposal concept is assumed where the high-active waste from 1400 t of uranium, remaining after conditioning, is solidified in borosilicate glass and distributed in 1.760 waste casks. These containers 1.2 m in height and 0.3 m in diameter are to be buried 10 years after the fuel is removed from the reactor in the 300 m deep boreholes of a salt dome. For this design the mean absorbed dose rates are calculated in the glass die (3.9 Gy/s), the steel mantle (0.26 Gy/s) and in the salt rock (0.12 Gy/s at a distance of 1 cm and 0.034 Gy/s at a distance of 9 cm from the container surface) valid at the beginning of disposal. The risk involved with these amounts of stored lattice energy is shortly discussed.

1761 **(RFP—3267) Immobilization of Rocky Flats wastes using the Inert Carrier Process.** Arnold, P.M.; Ledford, J.A.; Kasahara, M.; Hobart, S.A. (Rockwell International Corp., Golden, CO (USA). Rocky Flats Plant; Quadrex Corp., Campbell, CA (USA)). 1982. Contract AC04-76DP03533. 9p. (CONF-820424—37). NTIS, PC A02/MF A01. Order Number DE83000689.

From ANS topical meeting on treatment and handling of radioactive wastes; Richland, WA, USA (19 Apr 1982).

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The Inert Carrier Process marketed by the Chemical Systems Division of United Technologies Corporation in Coyote, California was selected by the Rocky Flats Plant to immobilize transuranic wastes. A demonstration plant to test this application was designed in a cooperative effort between Quadrex Corporation, United Technologies Corporation, and Rockwell International. The equipment was sized so that the demonstration unit could possibly be converted to a continuous production system in the future. The demonstration plant will test the use of Freon TF as an inert carrier and cement as a binding agent. Freon was suggested as the carrier since it is nonflammable and is currently used at the Rocky Flats site as a solvent; cement was considered as the most desirable binder since it is readily available and relatively inexpensive.

1762 **(RHO-BW-SA—220P) Groundwater flow and transport characteristics of flood basalts as determined from tracer experiments.** Leonhart, L.S.; Jackson, R.L.; Graham, D.L.; Thompson, G.M.; Gelhar, L.W. (Rockwell International Corp., Richland, WA (USA). Energy Systems Group; Arizona Univ., Tucson (USA); Massachusetts Inst. of Tech., Cambridge (USA)). 15 Sep 1982. Contract AC06-77RL01030. 15p. (CONF-820964—2). NTIS, PC A02/MF A01. Order Number DE83000718.

From Joint Pacific Northwest American Geophysical Union and American Association for the Advancement of Science meeting; Fairbanks, AK, USA (14 Sep 1982).

Work described in this paper contributes to the understanding of hydrologic performance of a proposed repository at the Hanford Site. Specifically, this paper describes the conduct and analysis of a two-well (injection/withdrawal) tracer test performed on a basalt interflow horizon (McCoy Canyon) beneath the Hanford Site. The overall purpose of the test was to initiate a phase of hydrologic testing that is directed primarily at obtaining estimates of parameters essential for contaminant transport modeling. Associated with this purpose were the following objectives: (1) to develop techniques and procedures for conducting groundwater tracer tests in the field and attendant laboratory analytical support; (2) to provide field data useful for evaluating available analytical methodologies to obtain estimates of dispersivity and porosity parameters; (3) to obtain estimates of longitudinal dispersivity and effective thickness for the test horizon that could be utilized in contaminant transport models; and (4) to provide a set of data that could be used to compare the test results obtained earlier, using an alternative technique, for the same horizon. The test was conducted in January 1982. The earlier testing was done in December 1979.

1763 **(RHO-BW-SA—243-P) Overview of the Basalt Waste Isolation Project.** Deju, R.A. (Rockwell International Corp., Richland, WA (USA). Energy Systems Group). Sep 1982. Contract AC06-77RL01030. 15p. (CONF-821205—22). NTIS, PC A02/MF A01. Order Number DE83001484.

From NWTS information meeting on basalt waste isolation project; Las Vegas, NV, USA (14 Dec 1982).

The Hanford Site was selected as a candidate area for study as a potential repository site. BWIP activities at Hanford include R and D, an Exploratory Shaft, a near-surface Test and Evaluation Facility, and the design and possible construction of a nuclear waste repository. Details of each of the BWIP studies conducted to date are given in this paper. (DLC)

1764 **(RHO-BW-SA—248-P) Performance assessment for a repository in basalt: a summary of preliminary results.** Baca, R.G.; Wilde, R.T.; Arnett, R.C.; Deju, R.A. (Rockwell International Corp., Richland, WA (USA). Energy Systems Group). Sep 1982. Contract AC06-77RL01030. 12p. (CONF-821205—21). NTIS, PC A02/MF A01. Order Number DE83001753.

From NWTS information meeting on basalt waste isolation project; Las Vegas, NV, USA (14 Dec 1982).

The basic objective of ongoing performance assessment studies, conducted by the Basalt Waste Isolation Project (BWIP), is to quantify the waste isolation capability of the deep basalt flows beneath the Hanford Site. This fiscal year a preliminary performance assessment study was initiated to examine and compare the long-term performance of candidate repository horizons within the reference repository location. This paper outlines the BWIP performance assessment approach and summarizes the results from recent analyses of postclosure performance.

1765 **(RHO-BW-SA—250-P) Geology of the reference repository location, Hanford Site, Washington.** Price, S.M.; Tallman, A.M.; Caggiano, J.A. (Rockwell International Corp., Richland, WA (USA). Energy Systems Group). Sep 1982. Contract AC06-77RL01030. 10p. (CONF-821205—9). NTIS, PC A02/MF A01. Order Number DE83001754.

From NWTS information meeting on basalt waste isolation project; Las Vegas, NV, USA (14 Dec 1982).

Within the west-central Cold Creek syncline in the Columbia plateau, a 47- Km^2 area is designated as the reference repository site for a nuclear waste repository. This paper presents an overview of the stratigraphic, structural, and tectonic settings of the reference repository. (The content of this paper is a summary of geologic information contained in the BWIP Site Characterization Report.) (DLC)

1766 **(RHO-BW-SA—276P) Radionuclide sorption and desorption mechanisms in interbed/groundwater systems of the Columbia River basalt formation.** Barney, G.S. (Rockwell International Corp., Richland, WA (USA). Rockwell Hanford Operations). Oct 1982. Contract AC06-77RL01030. 34p. (CONF-821053—1). NTIS, PC A03/MF A01. Order Number DE83002108.

From Workshop on standardization of methods for measuring migration of radionuclides in geomedia; Berlin, F.R. Germany (25 Oct 1982).

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The sorption and desorption mechanisms of key radionuclides (Tc, Np, Pu, Am, Cs, Sr, and Ra) in groundwater-interbed systems of the Columbia River basalt formation were investigated. Sandstone and tuff interbed materials from selected sedimentary interbeds were used in these experiments. The effects of groundwater composition and Eh on radionuclide sorption and desorption on the selected geologic solid were studied. Sodium, potassium, and calcium in the groundwater decrease sorption of Cs, Sr, and Ra by ion exchange reactions. Groundwater Eh strongly affects sorption of

Tc, Np, Pu, and U since chemical species of these elements containing the lower oxidation states are more extensively sorbed by chemisorption. Effects of radionuclide complexation by groundwater anions on sorption were not observed except for neptunium carbonate (or bicarbonate) complexes and plutonium sulfate complexes. Sorption and desorption isotherms were obtained for sorption of key radionuclides under oxidizing and reducing conditions. The Freundlich equation accurately describes most of these isotherms. Most radionuclides are apparently irreversibly sorbed on each of the geologic solids since the slopes of sorption and desorption isotherms for a given radionuclide are different. This hysteresis effect is very large and will cause a significant delay in radionuclide transport. It, therefore, should be included in modeling radionuclide transport to accurately assess the isolation capabilities of a repository in basalt.

1767 **(RHO-BWI-C—107-Vol.1) Study to identify a reference-repository location for a nuclear-waste repository on the Hanford site. Volume I. Text.** (Woodward-Clyde Consultants, San Francisco, CA (USA)). May 1981. Contract AC06-77RL01030. 186p. NTIS, PC A09/MF A01. Order Number DE83000973.

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The siting process involved screening the Pasco Basin using map overlays. No subareas in the Pasco Basin outside of the Hanford Site were found to be obviously superior to those within the Hanford Site. The screening guidelines were intended to: maximize public health and safety; minimize adverse environmental and socioeconomic impacts; and minimize system costs. The screening process reduced the area under considerations to five site localities. Nine candidate sites were identified within the site localities and then reduced to seven candidate sites. The seven candidate sites were located in the Cold Creek syncline. Geophysical data revealed possibly anomalous subsurface features (lineaments). Three additional candidate sites were then identified to avoid these geophysical lineaments. The ten candidate sites thus defined were ranked by a decision-analysis process. Ranking was performed by collecting geologic, hydrologic, and seismic data into a criteria matrix based on anticipated regulatory requirements. The ranking of the ten candidate sites resulted in the identification of a Reference Repository Location (RRL) and alternate site. The RRL encompasses about 18 square miles. (DLC)

1768 **(RHO-BWI-C—107-Vol.2) Study to identify a reference-repository location for a nuclear-waste repository on the Hanford site. Volume II. Appendices.** (Woodward-Clyde Consultants, San Francisco, CA (USA)). May 1981. Contract AC06-77RL01030. 199p. NTIS, PC A09/MF A01. Order Number DE83000972.

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Four appendices are included in this volume: criteria matrix results, guidelines and rationale, decision analysis methodology details, and glossary. (DLC)

1769 **(RHO-BWI-LD—32) Exploratory Shaft Test Facility in basalt. Project B-314 preconceptual design report.** (Rockwell International Corp., Richland, WA (USA). Rockwell Hanford Operations). Sep 1980. Contract AC06-77RL01030. 341p. NTIS, PC A15/MF A01. Order Number DE82022289.

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The Basalt Waste Isolation Project (BWIP) has been chartered to assess the feasibility of disposing high-level nuclear waste in a repository within the Hanford Site and to identify and characterize a site for such a repository if feasibility is shown. The BWIP site-identification studies to date have shown that such storage appears to be feasible and have narrowed the site location to a current area of 70 mi^2 within the Hanford Site. A site characterization plan is scheduled to be submitted to the US Nuclear Regulatory Commission (NRC) in May 1981 defining the plans to further reduce this potential area to that of a reference repository site. Subsequent to completion of the work outlined in that plan, a detailed site characterization plan will be submitted to the NRC in early 1982 defining the effort required to fully characterize the candidate site, so that it may be considered by DOE for banking and for comparison with sites in other geologic media. This banking decision requires characterization of the host rock. Thus, an Exploratory Shaft Test Facility (ESTF) is proposed to provide access to the candidate rock horizon as part of the characterization process. The proposed test facility to provide the in situ test space needed will consist of a drilled shaft and underground test chambers at an expected depth of 3700 ft. The finished shaft inside diameter will be 6 ft. Approximately 460 ft of chambers will be provided at the base of the shaft for testing space. The objectives of this preconceptual design effort were to: develop a feasible reference facility concept utilizing existing technology, provide the technical basis for functional design criteria (to be written later), assemble schedule and cost data for project planning, and recommend alternatives that should be considered in subsequent design.

1770 **(SAND—82-0962) Transient creep model for salt during stress loading and unloading.** Munson, D.E.; Dawson, P.R. (Sandia National Labs., Albuquerque, NM (USA); Cornell Univ., Ithaca, NY (USA). Sibley School of Mechanical and Aerospace Engineering). Sep 1982. Contract AC04-76DP00789. 57p. NTIS, PC A04/MF A01. Order Number DE83002137.

An empirical model is developed which accurately predicts the transient response of salt creep to incremental and decremental changes in stress and temperature. Even though the model is empirical, it is derived from a firm theoretical framework based upon the deformation-mechanism map for the micromechanical deformation processs and treats both steady-state and transient creep. In the model, transient functions modify the steady-state creep behavior. The description considers hypothetical potential functions in order to obtain strain rate vs. strain functions for the workhardening and recovery that occurs during transient creep. Conventional creep tests or stress-drop tests are analyzed using new methods for the complete evaluation of all parameters of the model. Then, the model is applied to stress-drop experimental results for complete recovery. Parameters for the model are also developed for southeastern New Mexico salt and are used to describe experimental results from tests that have complex loading and unloading histories. The model predictions compare well with the experimental results.

1771 **(SAND—82-1839C) Ocean disposal feasibility study: candidate DOE (FUSRAP) soil characterization.** Kupferman, S.L.; Anderson, D.R.; Brush, L.H.; Gomez, L.S.; Shephard, L.E. (Sandia National Labs., Albuquerque, NM (USA)). 1982. Contract AC04-76DP00789. 5p. (CONF-821103—23). NTIS, PC A02/MF A01. Order Number DE83000084.

From American Nuclear Society winter meeting; Washington, DC, USA (14 Nov 1982).

The Formerly Utilized Sites Remedial Action Program (FUSRAP) is to evaluate the radiological conditions at former MED-US AEC sites. Purpose of the Ocean FUSRAP program is to assess the feasibility of ocean disposal of FUSRAP waste which contains trace natural radioactive materials. This paper presents soil characterization information on the Middlesex, NJ, Sampling Plant site, and reports preliminary ocean dispersion calculations. (DLC)

1772 **(SAND—82-2192C) Data for evaluation of containment and repository/engineered barrier design.** Tillerson, J.R.; Myers, C.W. (Sandia National Labs., Albuquerque, NM (USA); Los Alamos National Lab., NM (USA)). 1982. Contract AC04-76DP00789. 4p. (CONF-821205—3). NTIS, PC A02/MF A01. Order Number DE83000323.

From NWTS information meeting on basalt waste isolation project; Las Vegas, NV, USA (14 Dec 1982).

Design and evaluation of a repository in tuff will require a substantial amount of accurate information and data, particularly as regards thermal, mechanical, mineralogical and hydrothermal phenomena. An integrated data gathering program is ongoing in the Nevada Nuclear Waste Storage Investigations (NNWSI) project to obtain laboratory, field and in-situ data to form the technical basis for technical decisions. The decisions for which the material data are needed, the types of data collected, the status and plans for these measurements and a specific example of the program for determining tuff elastic properties are described in this report. 1 figure.

1773 **(UCRL—87808) Results of instrument reliability study for high-level nuclear-waste repositories.** Rogue, F.; Binnall, E.P. (Lawrence Livermore National Lab., CA (USA); Lawrence Berkeley Lab., CA (USA)). Oct 1982. Contract W-7405-ENG-48. 7p. (CONF-821011—11). NTIS, PC A02/MF A01. Order Number DE83001540.

From IEEE nuclear science symposium; Washington, DC, USA (20 Oct 1982).

Reliable instrumentation will be needed to monitor the performance of future high-level waste repository sites. A study has been made to assess instrument reliability at Department of Energy (DOE) waste repository related experiments. Though the study covers a wide variety of instrumentation, this paper concentrates on experiences with geotechnical instrumentation in hostile repository-type environments. Manufacturers have made some changes to improve the reliability of instruments for repositories. This paper reviews the failure modes, rates, and mechanisms, along with manufacturer modifications and recommendations for additional improvements to enhance instrument performance. 4 tables.

1774 **(UNI—1692-Rev.1) Technical feasibility study of electrolytic ion transfer membranes for radioactive liquid waste processing.** (UNC Nuclear Industries, Inc., Richland, WA (USA)). 11 Aug 1982. Contract AC06-76RL01857. 154p. NTIS, PC A07/MF A01. Order Number DE82022197.

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Results are presented of a test program designed to determine the technical feasibility of INNOVA Ion Transfer Membranes (ITM) to separate radionuclides from waste streams at N Reactor. The ITM system was tested using the following test solutions, which either chemically simulated or duplicated the radioactive waste streams generated at N Reactor: TURCO 4512A - ^{59}Co, 4% Na_2So_4 - ^{59}Fe, and Ion Exchange Resin Regeneration (IXR) waste from an irradiated fuel storage basin. In addition, the ITM construction material was tested to determine its resistance to a radioactive environment. To assure that the ITM membranes could withstand a radioactive environment, samples of the ITM membrane material were exposed to high doses of gamma radiation and then tested for change in burst strength. The irradiated membranes did not show significant signs of degradation until a total gamma radiation exposure of 10^7 Rads was reached. Extrapolation of this data strongly suggests that the membrane life expectancy in a radiation environment is good. The following recommendations were made. Sequential unialysis be investigated for processing IXR waste. Reactor Decontamination Waste be treated by the Oxidation Reduction Coagulation cell prior to ITM processing to confirm pre-treatment feasibility. The Oxidation Reduction Coagulation cell be developed for other N Area applications. An ITM unialysis system be developed for selective radionuclide extraction from irradiated fuel storage basins. The ITM economic feasibility be determined on the applications tested in this report. A unialysis ITM system be tested for extraction of radionuclides from electropolish decontamination wastes.

1775 **(USGS-OFR—82-372) Water-level data for wells in Burial Ground 5, Oak Ridge National Laboratory, Tennessee, 1975-1979.** Webster, D.A.; Beatty, J.S.; Benjamin, P.M.; Tranum, W.M. (Geological Survey, Knoxville, TN (USA)). 1982. Contract W-7405-ENG-26. 149p. NTIS, PC A07/MF A01. Order Number DE83000627.

This report presents data pertaining to wells in Burial Ground 5 at ORNL for the period 1975 to 1979. It includes an inventory of wells, measurements of water levels, well hydrographs, and a map showing the location of the wells.

1776 **(USGS-OFR—82-701) Preliminary results of gravity investigations at Yucca Mountain and vicinity, Southern Nye County, Nevada.** Snyder, D.B.; Carr, W.J. (Geological Survey, Menlo Park, CA (USA)). 1982. Contract AI08-78ET44802. 56p. NTIS, PC A04/MF A01. Order Number DE83001725.

Exploration for a high-level-nuclear-waste-repository site in the Yucca Mountain area, Nevada, resulted in the addition of 423 new gravity stations during the past 2 years to the 934 existing stations to form the data base of this study. About 100 surface-rock samples, three borehole gamma-gamma logs, and one borehole gravity study provide excellent density control. A linear increase in density of 0.26 g/cm^3 per km is indicated in the tuff sequences makes the density contrast across the basal contact of the tuff the only strong source of gravity fluctuations. Isostatic and 2.0g/cm^3 Bouguer corrections were applied to the observed gravity values to remove deep-crust-related regional gradients and topographic effects, respectively. The resulting residual-gravity plot shows significant gravity anomalies that correlate closely with the structures inferred from drill-hole and surface geologic studies. Gravity highs over the three Paleozoic rock outcrops within the study area - Bare Mountain, the Calico Hills, and the Striped Hills - served as reference points for the gravity models. At least 3000 m of tuff fills a large steep-sided depression in the prevolcanic rocks beneath Yucca Mountain and Crater Flat. The gravity low and thick tuff section probably lie within a large collapse area comprising the Crater Flat-Timber Mountain-Silent Canyon caldera complexes. Gravity lows in Crater Flat itself are thought to coincide with the source areas of the Prow Pass Member, the Bullfrog Member, and the unnamed member of the Crater Flat Tuff. Southward extension of the broad gravity low associated with Crater Flat into the Amargosa Desert is evidence for sector graben-type collapse segments related to the Timber Mountain caldera and superimposed on the other structures within Crater Flat. 13 figures, 4 tables.

1777 **(USGS-OFR—82-931) Preliminary appraisal of gravity and magnetic data at Syncline Ridge, Western Yucca Flat, Nevada Test Site, Nye County, Nevada.** Ponce, D.A.; Hanna, W.F. (Geological Survey, Menlo Park, CA (USA)). 1982. Contract AI08-78ET44802. 21p. NTIS, PC A03/MF A01. Order Number DE83001806.

A gravity and magnetic study of the Syncline Ridge area was conducted as part of an investigation of argillite rocks of the Eleana Formation under consideration as a medium for the possible storage of high-level radioactive waste. Bouguer gravity anomaly, low-level aeromagnetic anomaly, density, and magnetization data collectively indicate the following, relative to the Eleana Formation, the principal target of the investigation: (1) in an area extending northwestward from Mine Mountain, through Syncline Ridge, to the Eleana Range, the Eleana Formation, where not exposed, occurs at depths of less than ~ 200 m, except for a small region of exposed older Paleozoic rocks; (2) in the region of shallowly buried Eleana Formation, occurrences of volcanic rock cover are delineated by low-level aeromagnetic anomaly data, which also discriminate normally polarized from reversely polarized tuff units; and (3) selective detection of high-quartz argillite relative to low-quartz argillite using surface gravity data is not feasible if the high-quartz and low-quartz varieties are intimately interbedded, as observed in boreholes. 4 figures, 2 tables.

1778 **High current resistance welding of nuclear waste containers.** Eberhard, B.J.; Kelker, J.W. Jr. (DuPont, Aiken, SC, USA). *Welding Journal (Miami);* **61**: No. 6, 15-19(Jun 1982).

This paper describes the development of a canister sealing method which led to a proposed production process for making the initial closure on nuclear wastes canisters of Type 304-L stainless steel. The welding machine is suited for use on a remotely operated facility. 1 ref.

1779 **Solid-state storage of radioactive krypton in a silica-based matrix.** Tingey, G.L.; Lytle, J.M.; Gray, W.J.; Wheeler, K.R. (Battelle, Pac Northwest Lab, Richland, Wash, USA). *Journal of the American Ceramic Society;* **65**: No. 1, 5-9(Jan 1982).

A method for storage of radioactive krypton in bottles made of ceramic materials is assessed. This paper discusses the feasibility of dissolving or trapping krypton in a porous silica-based glass. The dissolution or trapping occurs when the glass is exposed to krypton at high pressures and simultaneously sintered at high temperatures to close pores and markedly restrict the diffusion and release of the gas from the sample. 17 refs.

1780 **Actinide valences in borosilicate glass.** Karraker, D.G. (DuPont, Aiken, SC, USA). *Journal of the American Ceramic Society;* 65: No. 1, 53-55(Jan 1982).

Optical and Moessbauer spectra show that actinide ions are incorporated in a borosilicate glass matrix as U(VI), Np(IV), Pu(IV), and Am(III). Uranium was reduced by graphite to U(V) and U(IV), but Pu(IV) remained unchanged. It is inferred from their valences that Np, Pu, and Am are part of the borosilicate network and U is probably a network-modifier. 9 refs.

1781 **Acid digestion of combustible nuclear wastes.** Lerch, R.E.; Allen, C.R.; Blasewitz, A.G.; Maestas, E. (Hanford Eng Dev Lab, Richland, Wash, USA). *Nuclear and Chemical Waste Management;* 2: No. 4, 265-277(1981).

The status of the acid digestion development programs of various countries is discussed in this paper. The acid digestion process has been developed and demonstrated on an engineering scale in several countries and appears to be especially applicable to treatment of combustible wastes containing high levels of transuranic contamination, where there is potential for recovering the transuranic radionuclides. Because the process takes place at a relatively low temperature, the plutonium contained in the residue is in a form that can be readily recovered using standard leaching techniques. The process is adaptable to a wide variety of combustible wastes, such as cellulosics, plastics, rubber materials, and ion exchange resin. While the process has been developed and demonstrated in an engineering scale primarily for transuranic contaminated wastes, the process is also adaptable to beta-gamma wastes such as reactor ion exchange resins. 14 refs.

1782 **Development of a source term for radionuclide release from spent fuel in a basalt repository.** Kuhn, W.L. (Battelle, Pac Northwest Lab, Richland, Wash, USA). *Nuclear and Chemical Waste Management;* 2: No. 4, 253-257(1981).

An analysis of groundwater transport of radionuclides from a nuclear waste repository requires a "source term," i.e., a prediction of the rate of release of radionuclides from the repository. A relatively simple source term has been constructed to suppport a demonstration of analytical methodology being developed for use in repository licensing. For this study the postulated case of release from spent fuel in a basalt repository sheared by a fault was considered. The source term model illustrates the use of constraints in describing release behavior, without referring to a specific detailed waste package design. The technical approach used to construct the source term is discussed to illustrate how mass balance and equilibrium constraints can be used in support of repository licensing activities. Assumptions made because of incomplete understanding of leaching behavior are discussed. 9 refs.

1783 **Immobilization of high-level nuclear reactor wastes in SYNROC: a current appraisal.** Ringwood, A.E.; Oversby, V.M.; Kesson, S.E.; Sinclair, W.; Ware, N.; Hibberson, W.; Major, A. (Aust Natl Univ, Canberra, ACT). *Nuclear and Chemical Waste Management;* 2: No. 4, 287-305(1981).

A detailed investigation has been made of the comparative ability of SYNROC and borosilicate glasses to immobilize high level nuclear wastes for extremely long periods of time when buried in geological repositories. Under dynamic leaching conditions glasses tend to dissolve quasicongruently whereas the dissolution of SYNROC minerals is highly incongruent. Loss of low valence cations (e.g., Ca, Ba, Cs) from the near-surface regions of SYNROC minerals is highly incongruent. Loss of low valence cations (e.g., Ca, Ba, Cs) from the near-surface regions of SYNROC titanate minerals results in surface films consisting dominantly of titanium dioxide. Because of the extreme insolubility of SiO/sub 2/ in water, these films tend to protect the surface from further dissolution and hence the leach rates of SYNROC minerals fall off drastically with time, commonly by 2 orders-of-magnitude after 10-30 days of dynamic (undersaturated) leaching. The results demonstrate that SYNROC is more resistant to leaching than borosilicate glass. Experimental studies demonstrate low leachability of SYNROC minerals despite their exposure to large radiation doses. The superior leach resistance of SYNROC at elevated temperatures will make it possible to bury it in geological repositories within a few years after reprocessing, thereby avoiding the necessity for prolonged storage and supervision. 41 refs.

1784 **(PB—82-190968) Incineration in molten salts of alpha-contaminated solid waste.** Brambilla, G.; Quercioli, E.; Beaulardi, L.; Gritti, R. (Commission of the European Communities, Luxembourg). [nd]. 59p. NTIS, PC A04/MF A01.

Incineration by the molten salt process is found to be suitable for the safe destruction of alpha-contaminated waste without pollution but with the possibility of plutonium recovery. A detailed description of the processes involved in the incineration process is given covering: combustion, acid dissolution, recovery of U and/or Pu by electrolytic means, separation of ash, and recycling of the eutectic lithium/sodium/potassium sulphates. Bench scale and pilot plant designs are outlined. The advantages of this type of treatment are: the reduction in weight and volume of waste without incurring liquid or solid secondary effluents, and clean outlet gases. The operating temperature is relatively low, combustion can be adjusted, gas filtering is easy, and operation is safe. Further research is required into Pu recovery and compatibility of materials in acid ambient conditions of the molten salt.

1785 **(PB—82-204983) Actinide recycling in light water reactors: results of reactor physics calculations.** Guardini, S.; Smith, B.G.R. (Commission of the European Communities, Ispra (Italy). Joint Research Centre). [nd]. 83p. NTIS PC E05/MF E05.

A new concept for the management of high level nuclear waste has been explored involving the possibility of partitioning the by-product actinides and transmuting them into fission products. Previous reports described the LWR codes and preliminary results. Final results of the LWR calculations can now be given as well as the conclusions reached by the overall light water reactor physics study, based on: (a) zero, one, and two dimension calculations performed to evaluate isotope vectors, reactivity values and spatial flux and power perturbations, caused by the recycling of by-product actinides and, (b) sensitivity studies carried out to evaluate the influence of various parameters between cycle cooling time such as power density, fuel temperature and coolant density. Two different recycling schemes are investigated, involving recycling of transplutonium isotopes only or of all actinides, respectively, viz, U, Pu, Am and Cm.

1786 **(PB—82-212879) Investigation of a process for the pyrolysis of plutonium contaminated combustible solid waste. Final report.** Longstaff, B.; Cains, P.W.; Elliot, M.N.; Taylor, R.F. (Commission of the European Communities, Luxembourg). [nd]. 183p. NTIS PC E08/MF E08.

The course of the pyrolysis reaction has been investigated with respect to its rate and the products evolved. Small-scale thermogravimetric work has been carried out and the volatile pyrolysis products have been analyzed. Bench-scale semi-quantitative studies allowed the visual observation of the decomposition reactions and provided general knowledge of the properties and handling of the volatiles. Based on these studies, a pilot-scale model was set-up and finally a continuous feed model was developed. Techniques for the oxidation of the pyrolysis char and for burning the off-gases are described. Pyrolysis seems to offer an attractive alternative to incineration as a means of weight and volume reduction of solid, combustible waste containing plutonium.

1787 **(EUR—7052-DE) Acid digestion of plutonium-containing wastes. results of work leading to process development and the separation of plutonium from residues (nassverbrennung plutoniumhaltiger abfalle. ergebnisse von arbeiten zur verfahrensentwicklung und abtrennung von plutonium aus dem ruckstand).** Wieczorek, H.; Kemmler, G.; Muhr, G.; Pleasing, J. (Commission of the European Communities, Luxembourg). [nd]. 59p. NTIS PC E04/MF E04.

An inert experimental facility was developed for a waste throughput of 1.5 kg/h. Its main components are: the reactor (tray or ring reactor), the off-gas cleaning and the acid recycling systems, and the filter. Compared with the tray reactor, the ring reactor is smaller in size at comparable performance; there is no sedimentation of residues during operation; resuspension of any sediments formed after a temporary shut-down presents no problems. The amount of sulphuric acid aerosol formed during the process is independent of the specific surface temperature, provided heating is

kept below 70 kW/m2. The efficiency of separation of the off-gas purification system is highest if a total acid content of 7 mol/l is not exceeded. The amount of air needed for oxidation should be approximately 2 m3/h. The acids formed (H_2SO_4, HNO_3 and HCl), are distilled and the total sulphuric acid used, as well as more than 70% of the nitric acid, are recycled. Under the conditions of acid digestion and with a reaction period of 20 hours characterized by good mixing throughout, 94-99 wt% of plutonium oxides are converted to sulphate.

0530 Environmental Aspects

REFER ALSO TO CITATION(S) 1723, 1757, 1758, 1762, 1782, 1783, 2990, 3000, 3006, 3010, 3038, 3115

1788 **(DOE/EV/10305—7) Radioecological investigations of uranium-mill-tailings systems. Third technical progress report, October 1, 1981-September 30, 1982.** Whicker, F.W. (Colorado State Univ., Fort Collins (USA). Dept. of Radiology and Radiation Biology). 15 Oct 1982. Contract AC02-79EV10305. 124p. NTIS, PC A06/MF A01. Order Number DE83001372.

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This investigation quantitatively evaluates the potential release of important radionuclides from active and reclaimed uranium mill tailings and their entry into the food chain. For active mill tailings, we are trying to quantify the degree of escape and dispersal, primarily by wind, and to measure the accumulation of ^{238}U, ^{230}Th, ^{226}Ra, and ^{210}Po by various native plants. Of particular interest are the relationships between soil and vegetation at different sites, since the chemical environment of areas impacted by mill tailings are drastically different than undisturbed natural areas. Also of great interest, is the relative importance of various mechanisms of radionuclide accumulation by plants, such as root uptake and aerial deposition, followed by some degree of foliar absorption. In the case of reclaimed tailings, an experimental area was developed in which a slab of reasonably uniform tailings was covered with various depths of earthen materials and seeded with a native range mixture of forbs, grasses and shrubs. The influence of overburden depth on radon flux at the soil surface and on uptake of radionuclides by plants is currently under study. In addition, a comparison of radon flux from vegetated and non-vegetated subplots is underway.

1789 **(NRPB-R—126) Assessment of the radiological consequences of disposal of intermediate level wastes in argillaceous rock formations.** Hill, M.D.; Mobbs, S.F.; White, I.F. (National Radiological Protection Board, Harwell (UK)). Sep 1981. 46p. NTIS (US Sales Only), PC A03/MF A01; Also available from H.M. Stationery Office, price Pound3.00. Order Number DE82702545.

The aims are to review the available data on argillaceous rocks, to calculate the potential radiological consequences of disposal of intermediate level wastes in argillaceous rock formations, and to analyse the sensitivity of the results of the calculation to variations in the values of the major parameters. Two broad categories of wastes, of differing volume and radionuclide content, are considered. These wastes are assumed to be conditioned and packaged, prior to disposal in either a clay or shale formation. The radiological consequences of releases via ground-water are evaluated using appropriate mathematical models, and this is the only release mechanism considered. The results of the calculations and of the sensitivity analysis are used for three main purposes- the identification of priorities for the research required to evaluate this disposal option for intermediate level wastes, to derive interim guidance on performance objectives for conditioned waste forms and for waste packages, and to attempt to draw general conclusions about acceptable disposal depths and the relative suitability of clays and shales for disposal of intermediate level wastes. The assessment is a preliminary one, and the results do not provide an adequate basis for a decision on the acceptability of emplacing intermediate level wastes in argillaceous rock formations.

1790 **(NUREG/CR—2873-Vol.2) Nuclear-fuel-cycle risk assessment: descriptions of representative non-reactor facilities, Sections 15-19.** Schneider, K.J. (Pacific Northwest Lab., Richland, WA (USA)). Sep 1982. Contract AC06-76RL01830. 360p. (PNL—4036-Vol.2). NTIS, PC A16/MF A01.

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Information is presented under the following section headings: fuel reprocessing; spent fuel and high-level and transuranic waste storage; spent fuel and high-level and transuranic waste disposal; low-level and intermediate-level waste disposal; and, transportation of radioactive materials in the nuclear fuel cycle. In each of the first three sections a description is given on the mainline process, effluent processing and waste management systems, plant layout, and alternative process schemes. Safety information and a summary are also included in each. The section on transport of radioactive materials includes information on the transportation of uranium ore, uranium ore concentrate, UF_6, PuO_2 powder, unirradiated uranium and mixed-oxide fuel assemblies, spent fuel, solidified high-level waste, contact-handled transuranic waste, remote-handled transuranic waste, and low and intermediate level nontransuranic waste. A glossary is included. (JGB)

1791 **(PNL-SA—10548-S) Investigation of accidental pressurized-liquid releases in nuclear-fuel-cycle facilities.** Sutter, S.L.; Halverson, M.A. (Pacific Northwest Lab., Richland, WA (USA)). Jun 1982. Contract AC06-76RL01830. 2p. (CONF-820886—1). NTIS, PC A02/MF A01. Order Number DE83001950.

From 15. aerosol technology meeting; Berkeley, CA, USA (23 Aug 1982).

Experiments were performed using uranine and UNH solutions. Data on total mass airborne followed the following correlation: g = -0.013-0.000015 (Volume, cm^3) + 0.0003 (Pressure, psi). (DLC)

1792 **(RHO-SA—255P) Finite-element model evaluation of barrier configurations to reduce infiltration into waste-disposal structures: preliminary results and design considerations.** Lu, A.H.; Phillips, S.J.; Adams, M.R. (Rockwell International Corp., Canoga Park, CA (USA). Energy Systems Group). Sep 1982. Contract AC06-77RL01030. 20p. (CONF-820303—41). NTIS, PC A02/MF A01. Order Number DE83000813.

From Waste management conference; Tucson, AZ, USA (8 Mar 1982).

Barriers to reduce infiltration into waste burial disposal structures (trenches, pits, etc.) may be required to provide adequate waste confinement. The preliminary engineering design of these barriers should consider interrelated barrier performance factors. This paper summarizes preliminary computer simulation activities to further engineering barrier design efforts. Several barrier configurations were conceived and evaluated. Models were simulated for each barrier configuration using a finite element computer code. Results of this preliminary evaluation indicate that barrier configurations, depending on their morphology and materials, may significantly influence infiltration, flux, drainage, and storage of water through and within waste disposal structures. 9 figures.

1793 **(UCRL—53319) Estimation of tracer diffusion coefficients of ions in aqueous solution.** Miller, D.G. (Lawrence Livermore National Lab., CA (USA)). 7 Sep 1982. Contract W-7405-ENG-48. 19p. NTIS, PC A02/MF A01. Order Number DE83000338.

Equations are given for estimating tracer diffusion coefficients D/sub i/° of ions at infinite dilution in terms of limiting ionic conductances Λ/sub i/°. Also given are generalized Nernst-Hartley equations for binary and multicomponent diffusion coefficients D° and D/sub ij/°, respectively, at infinite dilution. Data, estimates, and correlations for Λ/sub i/° at 25°C and other temperatures are discussed. Estimated values of Λ/sub i/° are tabulated from 0-300°C for ions of waste isolation interest and for ions of economic interest in geothermal brines. Estimates of their tracer diffusion coefficients at infinite dilution are tabulated. A rule of thumb, good to a factor of 2, is presented. Very limited data (available only at 25°C) indicate that D/sub i//D/sub i/° generally declines as the

concentration of salt or supporting electrolyte increases. 6 figures, 2 tables.

0540 Health And Safety

REFER ALSO TO CITATION(S) 1713, 1742, 1751, 1790

1794 **(UCRL—15506) Nuclear-Fuel-Cycle Research Program: availability of geotoxic material.** Wachter, B.G.; Kresan, P.L. (Arizona Univ., Tucson (USA). Engineering Experiment Station). Sep 1982. Contract W-7405-ENG-48. 185p. NTIS, PC A09/MF A01. Order Number DE83001498.

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This report represents an analog approach to the characterization of the environmental behavior of geotoxic waste materials (toxic material emplaced in the earth's crust) as drawn from literature on the Oklo natural fission reactors and uranium ore deposits relative to radioactive wastes, and hydrothermal metal ore deposits relative to stable toxic wastes. The natural analog data were examined in terms of mobility and immobility of selected radioactive or stable waste elements and are presented in matrix relationship with their prime geochemical variables. A numerical system of ranking those relationships for purposes of hazard-indexing is proposed. Geochemical parameters (especially oxidation/reduction potential) are apparently more potent mobilizers/immobilizers than geological or hydrological conditions in many, if not most, geologic environments for most radioactive waste elements. Heavy metal wastes, by analogy to hydrothermal ore systems and geothermal systems, are less clear in their behavior but similar geochemical patterns do apply. Depth relationships between geochemical variables and waste element behavior show some surprises. It is significantly indicated that for waste isolation, deeper is not necessarily better geochemically. Relatively shallow isolation in host rocks such as shale could offer maximum immobility. This paper provides a geochemical outline for examining analog models as well as a departure point for improved quantification of geological and geochemical indexing of toxic waste hazards.

1795 **(PB—82-201963) Assessment of radioactive material released from a fuel fabrication plant under accidental conditions. Final report.** (Commission of the European Communities, Luxembourg). [nd]. 201p. NTIS PC E09/MF E09.

A mixed oxide fuel fabrication plant is basically a conventional industrial facility in which dangerous materials are processed. The potential hazards are of a conventional nature, and must be taken into account at the equipment and building design stage. The building must be considered as a sealed enclosure with controlled permeability. The electric power supplies, ventilation and filtration systems must be considered as a single overall system. It is suggested, generally speaking, that as the probability of accident occurrence becomes increasingly remote, the consequences of the accident become increasingly serious. A thorough overall reliability study will be required so that, based on the component materials selection, it will be possible to evaluate the occurrence probability of an incontrolable accident and to evaluate the extent of the hazard more accurately.

0550 Regulations

REFER ALSO TO CITATION(S) 1709, 1729, 1731, 1737, 1738, 1745, 2302, 2302, 2402

1796 **(INIS-mf—7025) Legal aspects of nuclear fuel supply.** Sartorelli, C. (International Nuclear Law Association (INLA), Brussels (Belgium)). Oct 1981. 16p. (In French). (CONF-8109120—28). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82780786.

From Nuclear International Jura '81; Palma de Mallorca, Spain (27 Sep 1981).

This paper discusses the problems of nuclear fuel supply in the context of the types of purchase of uranium, the different technical operations involved (enrichment, reprocessing) and finally, the control exercised over such materials in the framework of IAEA Safeguards and the "London Club" agreement between the supplying countries. A description follows of the functions of the Euratom Supply Agency in application of the Euratom's Treaty's provisions on the principle of equal access to ores, source and special fissile materials for Community countries.

1797 **(INIS-mf—7026) Legal problems connected with irradiated fuel reprocessing and its waste storage.** de Nercy, B. (International Nuclear Law Association (INLA), Brussels (Belgium)). Oct 1981. 12p. (In French). (CONF-8109120—29). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82780787.

From Nuclear International Jura '81; Palma de Mallorca, Spain (27 Sep 1981).

In view of its nature, an irradiated nuclear fuel reprocessing operation -and the contracts implementing it between the reprocessor and the customer- raises certain difficult legal problems. This paper analyzes this question from the legal viewpoint, in particular as regards nuclear fuel and material ownership and products or waste arising therefrom, as well as in the context of rules of international trade and non-proliferation standards.

1798 **(INIS-mf—7027) Legal aspects of sub-seabed disposal of radioactive waste.** Reyners, P. (Nuclear Energy Agency, 75 - Paris (France)). (International Nuclear Law Association (INLA), Brussels (Belgium)). Oct 1981. 30p. (In French). (CONF-8109120—18). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82780776.

From Nuclear International Jura '81; Palma de Mallorca, Spain (27 Sep 1981).

In connection with methods for disposal of highly radioactive waste, that consisting of burying such waste in the sub-seabed arouses an increasingly marked interest among specialists. Apart from the technical difficulties still to be overcome and current safety assessments, this method gives rise to quite considerable legal and political problems. Their solution will undoubtedly have a bearing on its chances of being implemented.

1799 **(INIS-mf—7029) Regulatory problems relating to physical protection of nuclear plants and materials in Italy.** Nocera, F. (Comitato Nazionale per l'Energia Nucleare, Rome (Italy)). (International Nuclear Law Association (INLA), Brussels (Belgium)). Oct 1981. 13p. (CONF-8109120—30). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82780788.

From Nuclear International Jura '81; Palma de Mallorca, Spain (27 Sep 1981).

Although the questions raised by physical protection have an international charater, it is important to know of national regulations in that field since exchange of information and study of common problems help to achieve satisfactory results. This paper analyzes the Italian situation, by illustrating legislative and administrative actions undertaken as well as the practices adopted in Italy to meet problems of prevention of malevolent acts against nuclear installations and substances, until such time an Act is passed in this respect. Finally, the author is in favour of the 1980 Convention of Physical Protection of Nuclear Material being ratified soon by a large number of countries.

1800 **(INIS-mf—7030) Legal Aspects of international cooperation in the physical protection of nuclear facilities and materials.** Herron, L.W. (International Atomic Energy Agency, Vienna (Austria)). (International Nuclear Law Association (INLA), Brussels (Belgium)). Oct 1981. 26p. (CONF-8109120—31). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82780789.

From Nuclear International Jura '81; Palma de Mallorca, Spain (27 Sep 1981).

This paper provides a detailed analysis of developments in the number field having led the IAEA to promote international cooperation in ensuring adequate physical protection of nuclear facilities and materials. This work resulted in the establishment of recommendations and guidelines in this respect and culminated in the development of the 1980 Convention on the Physical Protection of Nuclear Materials.

1801 **(INIS-mf—7031) Legal problems relating to possible conflicts between physical protection and the interests of employees.** Mueller, H. (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.)). (International Nuclear Law Association (INLA), Brussels (Belgium)). Oct 1981. 22p. (CONF-8109120—32). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82780790.

From Nuclear International Jura '81; Palma de Mallorca, Spain (27 Sep 1981).

This paper places in a social context the physical protection measures which have become increasingly important for the operation of nuclear installations and describes the way such measures affect the rights of the personnel concerned. It reviews possible areas of conflict between safeguarding national interests (non-proliferation issues and international obligations of the Federal Republic of Germany) and the personal rights of employees.

1802 **(INIS-mf—7032) Regulatory aspects of emergency action in the nuclear field.** Glaize, G. (CEA Centre d'Etudes Nucleaires de Fontenay-aux-Roses, 92 (France)). (International Nuclear Law Association (INLA), Brussels (Belgium)). Oct 1981. 12p. (In French). (CONF-8109120—33). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82780791.

From Nuclear International Jura '81; Palma de Mallorca, Spain (27 Sep 1981).

This paper describes in detail, on the basis of French national legislation and international recommendations and agreements, emergency schemes to be implemented in the event of a nuclear or radiological incident.

1803 **(INIS-mf—7037) Compensation of damage caused by diverted nuclear substances.** Deprimoz, J. (Pool Francais d'Assurance des Risques Atomiques, Paris (France)). (International Nuclear Law Association (INLA), Brussels (Belgium)). Oct 1981. 7p. (In French). (CONF-8109120—23). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82780781.

From Nuclear International Jura '81; Palma de Mallorca, Spain (27 Sep 1981).

This paper provides a comprehensive analysis of the insurance system for nuclear liability. As a rule, if nuclear fuel, radioactive products or waste are governed by nuclear energy law providing for strict and channelled liability, their legal holder will pay for damage arising from them anywhere within 20 years after theft or diversion and 10 years after the nuclear incident. In most countries, atomic liability insurers will implicitly grant their cover through policies underwritten by legal holders. If diverted substances have a low specific radioactivity, their legal holder remains liable according to common law and insurance policies cover this conventional liability.

1804 (INIS-mf—7132, pp vp) **Development of methods of nuclear fuel analyses for Czechoslovak safeguards system purposes.** Malek, Z.; Moravec, J. 1980. (In Czech). NTIS (US Sales Only), PC A09/MF A01.

From Nuclear Research Institute scientific and technical conference; Prague, Czechoslovakia (5 Jun 1980).

The Central Testing Laboratory of UJV Rez performs analyses of nuclear materials for the purposes of the Czechoslovak safeguards system, including routine analyses of uranium oxides, ammonium diuranate, uranium metal, carbides and uranium alloys, plutonium metal and mixed plutonium oxides. Uranium is determined by a modified Davis-Gray technique (oxidimetric titration of U(IV) with potassium dichromate), the NBL method (potentiometric titration of lN(VI) with potassium dichromate), mass spectrometry. Uranium concentration in solutions is determined by isotope dilution spectrometry. Plutonium determination is performed by the oxidation reduction method with plutonium oxidation to Pu(VI) with silver oxide, plutonium oxidation with cerium sulphate (indirect determination method), isotope dilution and alpha spectrometric analysis. Gamma spectrometry is used for nondestructive determination of U235 in nuclear material. Comparative experiments for testing accuracy and suitability of the methods developed are arranged by international organizations (IAEA, CMEA-VTR-2) or by the individual countries under the aegis of international organizations (SALE). (H.S.).

1805 **(INIS-mf—7151) 7 August 1981 - Royal Order on the organization of the status of personnel of the Service for the Technical Safety of Nuclear Installations.** 19 Aug 1981. 3p. (In French and Dutch). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83780022.

This Order sets up a Service for the Technical Safety of Nuclear Installations within the Ministry of Employment and Labour and provides for the status of its personnel. It includes a technical section and an administrative section.

1806 **(INIS-mf—7152) 14 August 1981 - Royal Order on the organization and administrative status of the personnel of the Service for Protection against Ionizing Radiation.** 25 Aug 1981. 7p. (In French and Dutch). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83780023.

This Order concerns the organization and the administrative structure of the Service for Protection against Ionizing Radiations. The Service, within the Ministry of Public Health and the Family, is responsible, inter alia, for controlling the application of legislation on radiation protection, for examining licensing applications for nuclear facilities and import and transport of radioactive substances.

1807 **(INIS-mf—7153) Decree No. 81-978 of 29 October 1981 setting up a Higher Council for Nuclear Safety.** 31 Oct 1981. 1p. (In French). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83780024.

This Decree amends the Decree of 13 March 1973 setting up a High Council for Nuclear Safety and a Central Service for the Safety of Nuclear Installations. The High Council, which is attached to the Ministry of industry, is competent to advise on all questions involving the safety of nuclear installations. Henceforth, the National Assembly, the Senate and the regional or general Councils concerned may request the Minister to submit for consideration by the High Council all important matters within its competence. (NEA).

1808 **(INIS-mf—7154) Decree No. 81-822 of 4 September 1981 amending Decree No. 76-845 of 1 September 1976 setting up a Council for External Nuclear Policy.** 6 Sep 1981. 1p. (In French). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83780025.

A Decree of 1 September 1976 had set up a Council for External Nuclear Policy responsible for defining the policy for the export of nuclear technology, equipment and products which are sensitive from the viewpoint of the non-proliferation of nuclear weapons. This Decree now amends the composition of the Council. (NEA).

1809 **(INIS-mf—7281) Nuclear exports and international cooperation.** McCardle, J.J. (Department of External Affairs, Ottawa, Ontario (Canada)). Jun 1981. 13p. (CONF-8106200—23). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83780077.

From 21. annual international conference on Canadian Nuclear Association and 2. annual conference on Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

Canada's nuclear export policy together with its non-proliferation and safeguards policy embrace both the country's desire to promote international cooperation in the peaceful uses of nuclear energy and its effort to minimize the risk of further proliferation of nuclear weapons. This policy reflects the belief that only if Canadian parliamentary and public opinion can be convinced that Canada's nuclear exports will not contribute to nuclear proliferation will the long-term health of the country's nuclear industry be assured. Canada requires a political commitment to non-proliferation from its nuclear partners, and looks to the IAEA to administer safeguards on nuclear material of Canadian origin to guarantee that commitment. Agreements reached with its nuclear partners are in accordance with provisions of the non-proliferation treaty and include a contingency provision for fall-back safeguards if the other state should withdraw from the NPT. Provision is made for mutual agreement on reprocessing and enrichment of nuclear material. Agreements have been reached with some twenty nuclear partners, and efforts are continuing to come to new international understanding on reprocessing, enrichment, and plutonium storage.

1810 **(KFK—3213) Statistical investigations for an optimal evaluation of data in international safeguards.** Beedgen, R. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Datenverarbeitung in der Technik). Sep 1981. 123p. (In German). Dep. NTIS (US Sales Only), MF A01. Order Number DE82750186.

In international safeguards of nuclear material the material accountancy is an essential principle of the IAEA. The material balance is closed with the operator's data which are verified by the inspector at the hand of independent measurements on a random sampling basis. The results of the inspector have a probabilistic character because of measurement uncertainties and sampling. A diverter has in principle two possibilities - diversion without data falsification and playing with the measurement uncertainties - diversion with data falsification that the material balance seems to be correct. The strategies of the inspector are - closing the material balance - independent verification of the operator's data. The question is answered which test procedure leads under certain assumptions to the highest detection probability where the false alarm probability is fixed. The possibility of an optimal strategy of the diverter is taken into account. The results are partly illustrated at the hand of examples.

1811 **(LA—9440-MS) In-plant measurements of gamma-ray transmissions for precise K-edge and passive assay of plutonium concentration and isotopic fractions in product solutions. Final report on TASTEX Task G.** Russo, P.A.; Hsue, S.T.; Sprinkle, J.K. Jr.; Johnson, S.S.; Asakura, Y.; Kondo, I.; Masui, J.; Shoji, K. (Los Alamos National Lab., NM (USA)). Aug 1982. Contract W-7405-ENG-36. 79p. NTIS, PC A05/MF A01. Order Number DE83000463.

Portions of document are illegible.

An instrument based upon high-resolution gamma-ray measurements has been tested for more than 1 year at the Tokai Reprocessing Facility for determination of plutonium concentration by K-edge absorption densitometry and for determination of plutonium isotopic fractions by transmission-corrected passive gamma-ray spectrometry. The nondestructive assay instrument was designed and built at Los Alamos National Laboratory for the Tokai Advanced Safeguards Technology Exercise (TASTEX). It was used at Tokai for the timely assay of more than 100 product solution samples during the TASTEX evaluations. The results were compared to reference values obtained by conventional destructive analysis of these samples. The precision and accuracy of plutonium concentrations measured by the K-edge technique are shown to be within 0.6% (1δ) in these applications. The precisions and accuracies of the isotopic fractions determined by these passive gamma-ray methods are shown to be within 0.4% for ^{239}Pu, 1% for ^{240}Pu and ^{241}Pu, and 10% for ^{242}Pu.

1812 **(LA—9480-MS) Automated on-line L-edge measurement of SNM concentration for near-real-time accounting.** Russo, P.A.; Marks, T. Jr.; Stephens, M.M.; Baker, A.L.; Cobb, D.D. (Los Alamos National Lab., NM (USA)). Sep 1982. Contract W-7405-ENG-36. 16p. NTIS, PC A02/MF A01. Order Number DE83000430.

Portions of document are illegible.

An L-edge densitometer has been modified, tested, and demonstrated for on-line assay of special nuclear material concentration in flowing solution streams. The demonstration was part of a larger demonstration of near-real-time nuclear materials accounting during a continuous, week-long, cold operation of the Barnwell facility. The L-edge data were automatically analyzed and the results were transmitted to the materials accounting computer once every 5.5 min for the duration of the cold run. This report compares the results of the L-edge analyses with the delayed results obtained from destructive analysis of samples withdrawn from the same process line. Comparisons are also made with the results obtained in near real time from an automated process control instrument installed in series with the L-edge densitometer. The performance of the L-edge instrument was reliable throughout the continuous operation. The assay precision was consistent with that predicted by the counting statistics of the measurement. The results of the L-edge assays show good agreement with those of the destructive assays. A gradually varying discrepancy (of a few percent) between the L-edge and the process control results remains unexplained.

1813 **(LA-UR—82-2753) Authentication of nuclear-material assays made with in-plant instruments.** Hatcher, C.R.; Hsue, S.T.; Russo, P.A. (Los Alamos National Lab., NM (USA)). 1982. Contract W-7405-ENG-36. 19p. (CONF-821119—6). NTIS, PC A02/MF A01. Order Number DE83000635.

From International symposium on recent advances in nuclear materials safeguards; Nienna, Australia (8 Nov 1982).

This paper develops a general approach for International Atomic Energy Agency (IAEA) authentication of nuclear material assays made with in-plant instruments under facility operator control. The IAEA is evaluating the use of in-plant instruments as a part of international safeguards at large bulk-handling facilities, such as reprocessing plants, fuel fabrication plants, and enrichment plants. One of the major technical problems associated with IAEA use of data from in-plant instruments is the need to show that there has been no tampering with the measurements. Two fundamentally different methods are discussed that can be used by IAEA inspectors to independently verify (or authenticate) measurements made with in-plant instruments. Method 1, called external authentication, uses a protected IAEA measurement technique to compare in-plant instrument results with IAEA results. Method 2, called internal authentication, uses protected IAEA standards, known physical constants, and special test procedures to determine the performance characteristics of the in-plant instrument. The importance of measurement control programs to detect normally expected instrument failures and procedural errors is also addressed. The paper concludes with a brief discussion of factors that should be considered by the designers of new in-plant instruments in order to facilitate IAEA authentication procedures.

1814 **(LA-UR—82-2754) Hybrid chemical and nondestructive-analysis technique.** Hsue, S.T.; Marsh, S.F.; Marks, T. (Los Alamos National Lab., NM (USA)). 1982. Contract W-7405-ENG-36. 11p. (CONF-821119—1). NTIS, PC A02/MF A01. Order Number DE83000613.

From International symposium on recent advances in nuclear materials safeguards; Nienna, Australia (8 Nov 1982).

A hybrid chemical/NDA technique has been applied at the Los Alamos National Laboratory to the assay of plutonium in ion-exchange effluents. Typical effluent solutions contain low concentrations of plutonium and high concentrations of americium. A simple trioctylphosphine oxide (TOPO) separation can remove 99.9% of the americium. The organic phase that contains the separated plutonium can be accurately assayed by monitoring the uranium L x-ray intensities.

1815 **(LA-UR—82-2781) Use of (D, MUF) and maximum-likelihood methods for detecting falsification and diversion in data-verification problems.** Goldman, A.S.; Beedgen, R. (Los Alamos National Lab., NM (USA); Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.)). 1982. Contract W-7405-ENG-36. 16p. (CONF-821119—7). NTIS, PC A02/MF A01. Order Number DE83000606.

From International symposium on recent advances in nuclear materials safeguards; Nienna, Australia (8 Nov 1982).

The investigation of data falsification and/or diversion is of major concern in nuclear materials accounting procedures used in international safeguards. In this paper, two procedures, denoted by (D,MUF) and LR (Likelihood Ratio), are discussed and compared when testing the hypothesis that neither diversion nor falsification has taken place versus the one-sided alternative that at least one of these parameters is positive. Critical regions and detection probabilities are given for both tests. It is shown that the LR method outperforms (D,MUF) when diversion and falsification take place.

1816 **(LA-UR—82-2807) Materials loss-detection sensitivities using process-grade measurement at AGNS BNFP.** Dayem, H.A.; Hakkila, E.A.; Baker, A.L.; Cobb, D.D. (Los Alamos National Lab., NM (USA)). 1982. Contract W-7405-ENG-36. 24p. (CONF-821119—9; IAEA-SM—260/90). NTIS, PC A02/MF A01. Order Number DE83000611.

From International symposium on recent advances in nuclear materials safeguards; Nienna, Australia (8 Nov 1982).

Portions of document are illegible.

Process quality measurement data from cold runs at AGNS BNFP are used to demonstrate near-real-time accounting and to evaluate contactor inventory estimation techniques. Process-grade measurements are used to close hourly materials balances. Loss-detection sensitivities for 1 day of between 4 and 18 kg uranium, at 50% detection probability and 2.5% false-alarm probability, are calculated for selected accounting areas. Pulsed-column inventory estimators are used to calculate an inventory that is 1 to 35% lower than column dump measurements. Loss-detection sensitivity could be improved by incorporating on-line waste stream measurements, improving laboratory measurements for process streams, and refining the pulsed-column inventory estimates.

1817 **(LA-UR—82-2973) Hand-held pulse-train-analysis instrument.** Nixon, K.V.; Garcia, C. (Los Alamos National Lab., NM (USA)). 1982. Contract W-7405-ENG-36. 5p. (CONF-821011—8). NTIS, PC A02/MF A01. Order Number DE83002060.

From IEEE nuclear science symposium; Washington, DC, USA (20 Oct 1982).

A portable hand-held pulse-train-analysis instrument uses a number-oriented microprocessor sequenced by a single component microprocessor. The incorporation of new CMOS integrated circuits makes possible complex analysis in a small, easily operated, battery-powered unit. The instrument solves an immediate problem with threshold setting of plastic scintillators and promises numerous other applications.

1818 **(LA-UR—82-2975) Neutron-multiplication measurement instrument.** Nixon, K.V.; Dowdy, E.J.; France, S.W.; Millegan, D.R.; Robba, A.A. (Los Alamos National Lab., NM (USA)). 1982. Contract W-7405-ENG-36. 6p. (CONF-821011—3). NTIS, PC A02/MF A01. Order Number DE83002073.

From IEEE nuclear science symposium; Washington, DC, USA (20 Oct 1982).

The Advanced Nuclear Technology Group of the Los Alamos National Laboratory is now using intelligent data-acquisition and analysis instrumentation for determining the multiplication of nuclear material. Earlier instrumentation, such as the large NIM-crate systems, depended on house power and required additional computation to determine multiplication or to estimate error. The portable, battery-powered multiplication measurement unit, with advanced computational power, acquires data, calculates multiplication, and completes error analysis automatically. Thus, the multiplication is determined easily and an available error estimate enables the user to judge the significance of results.

1819 **(LA-UR—82-3014) Assay of spent fuel by a simple reactivity method.** Lee, D.M.; Lindquist, L.O. (Los Alamos National Lab., NM (USA)). 1982. Contract W-7405-ENG-36. 6p. (CONF-821011—7). NTIS, PC A02/MF A01. Order Number DE83001976.

From IEEE nuclear science symposium; Washington, DC, USA (20 Oct 1982).

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A new method for the assay of spent-fuel assemblies has been developed that eliminates the need for external isotopic neutron sources, yet retains the advantages of an active interrogation system. The assay is accomplished by changing the reactivity of the system and correlating the measurements to burnup. 7 figures.

1820 **(NUREG/BR—0025-82/04) Information report on state legislation: volume 8, number 4.** (Nuclear Regulatory Commission, Washington, DC (USA). Office of State Programs). Apr 1982. 13p. NTIS, PC A02/MF A01.

Pennsylvania SR-225 serves as an interesting tool for educating legislators on the provisions of the Low-Level Radioactive Waste Policy Act of 1980 (LLRWPA), which authorizes States to form regional compacts for the purpose of selecting and maintaining low-level waste disposal sites. States introducing Compact legislation in this issue are Colorado, Georgia, Hawaii, Kansas and Virginia. The U.S. General Accounting Office has begun its investigation into State/Federal low-level waste management activities.

1821 **(NUREG/BR—0025-82/05) Information report on state legislation, volume 8, number 5.** Landau, M.S. (Nuclear Regulatory Commission, Washington, DC (USA). Office of State Programs). May 1982. 15p. NTIS, PC A02/MF A01.

The NRC held a meeting with the State Liaison Officers (SLO's) of Region V, in Walnut Creek, California, March 31-April 1. Topics of discussion at the Region V meeting included emergency preparedness, high and low level radioactive waste, transportation, the Agreement State program, and NRC's regionalization. All States attended except for Nevada, whose representative was prevented from attending due to inclement weather. Legislative activity has been slower in 1982, as is usually the case in even-numbered years. The States whose legislative sessions have already adjourned are Florida, Georgia, Idaho, Indiana, Minnesota, New Mexico, South Dakota, Utah, Virginia (not carried over to 1983), West Virginia and Wyoming.

1822 **(NUREG/CR—2297) Security management techniques and evaluative checklists for security force effectiveness. Technical report (final) Sep 80-Jul 81.** Schurman, D.L.; Datesman, G.H. Jr; Truitt, J.O. (Applied Science Associates, Inc., Valencia, PA (USA)). Apr 1982. 129p. NTIS, PC A07/MF A01.

The report presents a system for evaluating and correcting deficiencies in security-force effectiveness in licensed nuclear facilities. There are four checklists which security managers can copy directly, or can use as guidelines for developing their own checklists. The checklists are keyed to corrective-action guides found in the body of the report. In addition to the corrective-action guides, the report gives background information on the nature of security systems and discussions of various special problems of the licensed nuclear industry.

1823 **(NUREG/CR—2820) Resolution of shipper-receiver differences.** Johnston, J.W.; Brouns, R.J.; Stewart, K.B. (Battelle Pacific Northwest Labs., Richland, WA (USA)). Sep 1982. Contract AC06-76RL01830. 115p. GPO $5.50.

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This report describes statistical procedures for resolving significant shipper-receiver differences (SRDs) for nuclear material transfers and calculating the best estimate of the true amount of special nuclear material transferred. The resolution of an SRD should generally be accomplished by identifying and removing its causes. Physical and statistical methods and logical stepwise procedures for investigating an SRD under various circumstances are recommended in this report. It is concluded that the best estimates of the true quantities of special nuclear material in a transaction are obtained by calculating the inverse variance-weighted values of the net weights, element fractions, and isotope fractions using the measurement results from the shipper, receiver, and referee laboratory, if any, that are accepted as the best available data.

1824 **(RHO-CD—1106-Rev.1) Nuclear materials inventory plan.** Doerr, R.W.; Nichols, D.H. (Rockwell International Corp., Richland, WA (USA). Rockwell Hanford Operations). Mar 1982. Contract AC06-77RL01030. 26p. NTIS, PC A03/MF A01. Order Number DE83001042.

In any processing, manufacturing, or active storage facility it is impractical to assume that any physical security system can prevent the diversion of Special Nuclear Material (SNM). It is, therefore, the responsibility of any DOE Contractor, Licensee, or other holder of SNM to provide assurance that loss or diversion of a significant quantity of SNM is detectable. This ability to detect must be accomplishable within a reasonable time interval and can be accomplished only by taking physical inventories. The information gained and decisions resulting from these inventories can be no better than the SNM accounting system and the quality of measurements performed for each receipt, removal and inventory. Inventories interrupt processing or production operations, increase personnel exposures, and can add significantly to the cost of any operation. Therefore, realistic goals for the inventory must be defined and the relationship of the inherent parameters used in its validation be determined. Purpose of this document is to provide a statement of goals and a plan of action to achieve them.

1825 **(PB—82-199191) Ultrasonically identified cap seal for LWR fuel bundles.** Burgers, W.; Dal Cero, J.; Crutzen, S. (Commission of the European Communities, Ispra (Italy). Joint Research Centre). [nd]. 57p. NTIS PC E04/MF E04.

Techniques available for surveillance and sealing, marking or otherwise identifying fissile material so that its recognition and integrity are assured, are reviewed. In order to verify the integrity of sealed fissile material, the seal must be tamper indicating. To this end, acoustic methods have been developed to facilitate the unique identification of inherent marks, artificial marks, and of seals containing internal marks. A powder metallurgy sintering technique and a brazing technique have been developed at Ispra for the fabrication of seals, and ultrasonic identification equipment has been manufactured. Experimental application of these cap seals at two reactor sites has proved to be easy, fast and inexpensive.

06 FUSION FUELS

0601 Sources

1826 **(MLM—2995-OP) Process monitoring of tritium concentration.** Ellefson, R.E. (Monsanto Research Corp., Miamisburg, OH (USA). Mound Facility). 1982. Contract AC04-76DP00053. 14p. (CONF-821111—5). NTIS, PC A02/MF A01. Order Number DE82021313.

From 29. national symposium on American Vacuum Society; Baltimore, MD, USA (16 Nov 1982).

Tritium fueling and recycle processes for the fusion industry need measurement of tritium concentrations at various points for control decisions. A prototype process sampling and analysis system built to monitor tritium concentration in a thermal diffusion column used to enrich tritium is described. The system draws a 2 cc gas sample from a selected point and analyzes tritium concentration. Concentration is determined using a beta scintillation detector to measure tritium partial pressure in ratio to total sample pressure measured using a 1 torr capacitance manometer. Calibration accuracy of the beta scintillation detector is 1.4%-rel/C^0 plus electrometer zero drift. Accuracies $\leqq$ 6%-rel for 1 mole % of tritium reducing to $\leqq$ 1.5% rel at 90 mole % tritium are routinely produced in a typical air-conditioned laboratory. Temperature control of +-0.1C^0 improves accuracies to one-fifth the level for ambient conditions. For high purity tritium (> 90%), a miniature quadrupole mass spectrometer with Faraday ion detection is required to assay tritium purity by differences (100% minus non-tritium components). The detection limits of 0.2% for DT and 0.5% for HT and HD place ultimate limits on purity measurements. The sampling and analysis system is fully automated allowing arbitrary sampling points or a timed sampling sequence. A method for direct measure of tritium partial pressure in exhaust lines of a fusion device is also presented. 4 figures.

0607 Waste Management

REFER ALSO TO CITATION(S) 1743, 1826

1827 **(UCRL—87786) Issues in radioactive-waste management for fusion power.** Maninger, R.C.; Dorn, D.W. (Lawrence Livermore National Lab., CA (USA)). 12 Oct 10082. Contract W-7405-ENG-48. 8p. (CONF-821011—9). NTIS, PC A02/MF A01. Order Number DE83001178.

From IEEE nuclear science symposium; Washington, DC, USA (20 Oct 1982).

Analysis of recent conceptual designs reveals that commercial fusion power systems will raise issues of occupational and public health and safety. This paper focuses on radioactive wastes from fusion reactor materials activated by neutrons. The analysis shows that different selections of materials and neutronic designs can make differences in orders-of-magnitude of the kinds and amounts of radioactivity to be expected. By careful and early evaluation of the impacts of the selections on waste management, designers can produce fusion power systems with radiation from waste well below today's limits for occupational and public health and safety.

07 ISOTOPE AND RADIATION SOURCE TECHNOLOGY

0701 Physical Isotope Separation

1828 **(AECL—7412) Atomic Energy of Canada Limited-Chemical Company Annual review of operations, 1980-81.** (Atomic Energy of Canada Ltd., Ottawa, Ontario. Heavy Water Projects). 1981. 18p. (In English, French). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702556.

Record production of heavy water was achieved: the plants at Glace Bay and Port Hawkesbury, Nova Scotia, produced a total of 560 megagrams. A shipment of 500 Mg was delivered on time to the Wolsung CANDU reactor in Korea. Energy conservation and waste heat utilization programs included the construction of a greenhouse at the Glace Bay site. Long-term protection of the La Prade site is essentially complete. The company has reorganized its marketing and engineering division and assumed a greater international role.

0702 Radiation Sources

REFER ALSO TO CITATION(S) 2799, 2846

1829 (INIS-mf—7132, pp vp) **Research in the field of ionizing radiation.** Bednar, J. 1980. (In Czech). NTIS (US Sales Only), PC A09/MF A01.

From Nuclear Research Institute scientific and technical conference; Prague, Czechoslovakia (5 Jun 1980).

Research involves three coordinated research programmes, ie., "Radiation Technology", "Radiopharmaceuticals" and "Detectors". The radiation chemical processes field includes, eg., radiation curing of cables with silicon insulation, radiation sterilization of medical aids, wood treatment and protection by radiation copolymerization. Within the "Radiopharmaceuticals" project, new labelled compounds are being developed, such as sodium ^{131}I-o-iodohippurate, ^{131}I-rose bengal, sodium sup(99m)Tc-pertechnetate. Ge(Li), CdTe and Si detectors are being developed within the third project. (H.S.).

1830 (INIS-SU—125, pp 552) **Radiation-physical experiment planning on a class of matrices-circulants.** Fedorov, G.A.; Tereshchenko, S.A. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

1831 **(KFK-AFR—004) Publications of AFR-members on the subject of Applied radionuclide technology.** (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Arbeitsgemeinschaft zur Foerderung der Radionuklidtechnik). Dec 1981. 41p. (In German). Dep. NTIS (US Sales Only), MF A01. Order Number DE82750648.

This compilation prepared for the first time in this form and containing publications announced by the AFR office on the subject of 'Applied radionuclide technology' does neither claim completeness nor is it clearly visible that all contributions relate to the year 1980. None the less, this compilation of reports of results, together with the 'General Program on the Advancement of the Radionuclide Technology' (AFR report No. 001) and the AFR subject list, constitute an important reference to the documentation of results achieved within the preceding period of time. It is thus possible to compare, at least in partial areas of the application spectrum of radionuclide technology, scientific problems with solutions realized.

1832 **(LA-UR—82-2596) Studies of a lead reflector for a pulsed neutron source.** Taylor, A.D.; Russell, G.J.; Meier, M.M.; Robinson, H. (Los Alamos National Lab., NM (USA)). 1982. Contract W-7405-ENG-36. 21p. (CONF-8206118—4). NTIS, PC A02/MF A01. Order Number DE83000331.

From 6. annual international collaboration of advanced neutron sources meeting; Argonne, IL, USA (28 Jun 1982).

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This paper examines the consequences of adopting a non-moderating reflector and compares its performance to that of beryllium. Reflector studies on a time modulated source have shown lead to be an excellent reflector, maintaining the structure of the long time pulse (500 μs) marginally better than beryllium and with a slightly superior yield. Engineering, fabrication and cost factors as well as improved gamma and fast neutron shielding properties further favour lead as a reflector for these sources. Even for truly pulsed sources which rely primarily on time of flight for energy selection, Monte Carlo studies have shown that a lead reflector maintains an excellent time structure in hydrogenous moderators in the slowing down region. This paper describes the experimental comparison of lead and beryllium reflectors for the case of a pulsed spallation source. The target-moderator-reflector configuration used was a mock-up of the Rutherford Appleton Laboratory's SNS geometry. The experiments were performed in the low current target area of the Los Alamos National Laboratory's spallation source, the WNR. This work was complemented by Monte Carlo calculations using the TIMOC code.

1833 **(LA-UR—82-3018) Characteristics of the WNR: a pulsed spallation neutron source.** Russell, G.J.; Lisowski, P.W.; Howe, S.D.; King, N.S.P.; Meier, M.M. (Los Alamos National Lab., NM (USA)). 1982. Contract W-7405-ENG-36. 6p. (CONF-820942—20). NTIS, PC A02/MF A01. Order Number DE83001975.

From Nuclear data for science and technology international conference; Antwerp, Belgium (6 Sep 1982).

Portions of document are illegible.

The Weapons Neutron Research facility (WNR) is a pulsed spallation neutron source in operation at the Los Alamos National Laboratory. The WNR uses part of the 800-MeV proton beam from the Clinton P. Anderson Meson Physics Facility accelerator. By choosing different target and moderator configurations and varying the proton pulse structure, the WNR can provide a white neutron source spanning the energy range from a few MeV to 800 MeV. The neutron spectrum from a bare target has been measured and is compared with predictions using an Intranuclear Cascade model coupled to a Monte Carlo transport code. Calculations and measurements of the neutronics of WNR target-moderator assemblies are presented.

1834 **Clostridia and sterilization of sludges from processing stations with gamma radiation.** Anselme, P.; Brakel, J.; Paul, R. (Faculte des Sciences Agronomiques de l'Etat, Gembloux (Belgium)); Lacroix, J.P. (Institut National des Radioelements, Brussels (Belgium)). pp 439-446 of Characterization, treatment and use of sewage sludge. L'Hermite, P.; Ott, H. (Commission of the European Communities, Brussels (Belgium). Directorate General for Research, Science and Education) (eds.). Dordrecht, Netherlands; D. Reidel (1981). (In French)

From 2. European symposium on characterication, treatment and use of sewage sludge; Vienna, Austria (21 Oct 1980).

Considering the economical aspect of sludge irradiation, the dosis of 300 Krad of gamma radiation seems quite satisfactory, at least for unsporulated bacteria. But, at this level, sporulating bacteria such as Clostridia do not disappear: more than 60 percent of the spores escaped treatment. In order to improve the results, the synergistic effect of gamma rays and calcium peroxide was tested. In definite conditions, the results were promising.

0703 Isotopic Power Supplies

1835 **(LA—9547-PR) Flight-systems-safety program. Progress report, May 1982.** Bronisz, S.E. (comp.). (Los Alamos National Lab., NM (USA)). Oct 1982. Contract W-7405-ENG-36. 14p. NTIS, PC A02/MF A01. Order Number DE83002301.

This technical monthly report covers studies related to the use of $^{238}PuO_2$ in radioisotope power systems carried out for the Office of Space Nuclear Projects of the US Department of Energy by Los Alamos National Laboratory. Most of the studies discussed here are ongoing. Results and conclusions described may change as the work continues.

1836 **(LA—9548-PR) Flight-systems-safety program. Progress report, June 1982.** Bronisz, S.E. (comp.). (Los Alamos National Lab., NM (USA)). Oct 1982. Contract W-7405-ENG-36. 7p. NTIS, PC A02/MF A01. Order Number DE83002299.

This technical monthly report covers studies related to the use of $^{238}PuO_2$ in radioisotope power systems carried out for the office of space Nuclear Projects of the US Department of Energy by Los Alamos National Laboratory. Most of the studies discussed here are ongoing. Results and conclusions described may change as the work continues.

08 HYDROGEN

0801 Production

REFER ALSO TO CITATION(S) 1895, 1967, 2661

1837 **(AD-A—113878/3) Photoassisted water-gas shift reaction on platinized titania: the influence of preparation parameters. Technical report no. 22, 1 Jan-31 Dec 82.** Fang, S.; Chen, B.; White, J.M. (Texas Univ., Austin (USA). Dept. of Chemistry). 12 Apr 1982. 16p. NTIS, PC A02/MF A01.

The variation of the rate of the photoassisted water-gas shift reaction over platinized titania with changes in catalyst preparation has been studied - The following parameters were varied: (1) extent of hydrogen reduction; (2) Pt loading; (3) method of depositing Pt; (4) light intensity; and (5) NaOH loading. The reaction rate does not depend on the method of Pt deposition; is first order in light intensity; is not dependent on the chemical state or the Pt loading above 2 wt.%; depends on reduction of the titania and is strongly dependent on the surface concentration of NaOH. From this work, we conclude that when NaOH is present, the rate limiting step in the reaction is the reaction of photoproduced holes with surface OH(-) ions.

1838 **(CONF-820605—20) Status of the cadmium thermoelectrochemical hydrogen cycle.** Whaley, T.; Yudow, B.; Remick, R.; Pangborn, J.; Sammells, A. (Institute of Gas Technology, Chicago, IL (USA)). 1982. 8p. NTIS, PC A02/MF A01. Order Number DE83900088.

From World hydrogen energy conference; Pasadena, CA, USA (13 Jun 1982).

The three-step cadmium thermoelectrochemical water-splitting cycle produces hydrogen by an electrochemical reaction of water with an anode of cadmium metal, which is regenerated by the thermochemical decomposition of by-product cadmium oxide at temperatures of 1200°C and higher. Work on the electrochemical step has centered on the removal of the passivating layer of cadmium hydroxide that forms on the cadmium metal anode. The high-temperature thermochemical decomposition of cadmium oxide has been carried out successfully in a solar furnace.

1839 **(PB—82-208166) Assessment and investigation of containment materials for the sulfur-iodine thermochemical water-splitting process for hydrogen production. Final report Jul 79-Dec 80.** Trester, P.W.; Staley, H.G. (General Atomic Co., San Diego, CA (USA)). May 1981. 273p. NTIS, PC A12/MF A01.

This report summarizes the materials investigations conducted at General Atomic to support the on-going process development of the sulfur-iodine thermochemical water-splitting process to produce hydrogen. It presents data from compatibility tests in which candidate construction materials were exposed to chemical and temperature environments simulating the principal process fluids of the water-splitting cycle. The environments were (1) mixtures of HI-H2O-I2 and I2 in the range of 295 to 423 K, (2) H2SO4 acid (60 wt%) at 398 K, and (3) H2SO4 vapor decomposition products at 1173 K. The program group identified commercial construction materials for each environment. These materials demonstrated adequate compatibility for use in the conceptual design of a pilot plant

and a commercial-size process plant. Mixtures of HI-H2O-I2 were very corrosive to most metals and alloys used in the chemical industry. Increased temperature rapidly accelerated corrosion and increased absorption in fluorocarbon plastics and elastomers. These investigations helped to select candidate materials, including metals, alloys, ceramics, plastics, and elastomers, to handle many of the more aggressive and corrosive fluids anticipated in the chemical process operation.

1840 **(PB—82-208174) Thermochemical water-splitting for hydrogen production. Final report 1 Jan 75-31 Dec 80.** Norman, J.H.; Basenbruch, G.E.; O'Keefe, D.R. (General Atomic Co., San Diego, CA (USA)). Mar 1981. 232p. NTIS, PC A11/MF A01.

This report summarizes the work at GA on the sulfur-iodine water-splitting cycle. It presents data for the SO2-I2-H2O reaction. This reaction forms two separable phases: (1) one rich in H2SO4, (2) the other rich in HI. This report describes how the H2SO4 phase is enhanced by further reaction on contact with I2(l) and SO2. Catalytic decomposition of vaporized H2SO4 into SO2, H2O, and O2 and recovery of these products was found to be feasible. It reports on the conversion using H3PO4 of the HI product phase into the components, I2, H2O, and HI. Both gaseous and liquid catalytic conversion of HI were found to be reasonable processes to produce H2. In addition, the task group at GA has tried to improve the cycle, particularly to better handle the HI-pregnant phase. As a result of these studies, the sulfur-iodine water-splitting cycle is a leading candidate for commercialization with appropriate high-quality heat from fission reactors, fusion reactors, and concentrated solar energy. Engineering evaluations have determined the thermal efficiency of the cycle to be about 47%. Cost evaluations under way on another program of GA and done previously by other engineers support the commercial viability of the cycle.

1841 **(SERI/STR—231-1722) Chemical storage of light energy.** Potts, K.T. (Rensselaer Polytechnic Inst., Troy, NY (USA)). Sep 1982. Contract AC02-77CH00178. 21p. NTIS, PC A02/MF A01. Order Number DE82022156.

The objective is to develop new 2,2'-bipyridinyl ligands with long-chain, electron donating substituents in the 4,4'-positions and study their complexation with ruthenium for ultimate use as catalysts in the generation of hydrogen by photoreduction of water. Initial development focused on new, practical syntheses of 2,2'-bipyridinyl derivatives. Accomplishments include the synthesis and characterization of 2,2'-bipyridinyl containing 4,4'-bis (ethylthio) substituents, 4,4'-bis(tetradecanamido) substituents, and 4,4'-bis(tetradecylamino) substituents.

1842 **Enzymatic synthesis of formic acid from H/sub 2/ and CO/sub 2/ and production of hydrogen from formic acid.** Klibanov, A.M.; Alberti, B.N.; Zale, S.E. (MIT, Cambridge, Mass, USA). *Biotechnology and Bioengineering;* **24**: No. 1, 25-36(Jan 1982).

Whole cells of Alcaligenes eutrophus (as well as isolated P. oxalaticus formate dehydrogenase and A. eutrophus hydrogenase coupled via nicotinamide adenine dinucleotide or methyl viologen) have been shown to produce H/sub 2/ from formic acid. Immobilization of the cells in the kappa-carrageenan gel greatly enhances their stability at room temperature. The rate of hydrogen production catalyzed by immobilized A. eutrophus has been studied as a function of the concentrations of the cells and formate and also pH. An inhibition by high concentrations of formate has been found. Immobilized cells were also capable of synthesizing formate from H/sub 2/ and bicarbonate. Yields of formate up to 30% have been obtained. The catalytic efficiency of immobilized A. eutrophus cells was compared with that of palladium adsorbed on activated carbon. 35 refs.

1843 **(PB—82-205444) Development of a thin-layer preparation procedure for ZrO_2 (Y_2O_3) electrolytes on a porous substrate (entwicklung eines duennschicht-praeparationsverfahrens fuer zro2 (y2o3) elektrolyte auf poroeser traegerstruktur, abschlussbericht). Final report.** Dietrich, G.; Doenitz, W.; Hermeking, H.; Oehme, G.; Wahl, J. (Commission of the European Communities, Luxembourg). [nd]. 87p. NTIS PC E05/MF E05.

A method is presented for the vapour-phase deposition of a homogeneous, gas-tight, thin-layer electrolyte on a porous support for use in the high-temperature water electrolysis production of hydrogen.

0802 Storage

1844 **(NP—2904428) Ferromagnetic resonance studies of nickel substrate catalysts and $LaNi_5$ hydrogen accumulators.** Kuehnemann, B. (Hannover Univ. (Germany, F.R.). Fakultaet fuer Mathematik und Naturwissenschaften). 17 Feb 1981. 136p. (In German). NTIS (US Sales Only), PC A07/MF A01. Order Number DE82904428.

Thesis.

Nickel substrate catalysts with three different particle size distributions have been characterized and studied with respect to the influence of gases by the method of ferromagnetic resonance (FMR) under UHV conditions. The same measurements have been performed for $LaNi_5$ and a comparision of the results is given. The pure nickel substrate catalyst samples are characterized geometrically by the methods of scanning and transmission electron microscopy. Using the ferromagnetic resonance results of these systems together with simple models, a magnetic characterization has been worked out. All catalysts of this study consist of ferromagnetic and superparamagnetic domains, the relative share of which could be determined quantitatively. The relation between the magnetic anisotropy field Hsub(L) of thin UHV-evaporation films and the effective anisotropy field Hsub(i) of small Ni-particles on substrate catalysts has been deduced, using a simple model. In addition the influence of adsorbed gases (H_2, CO, CO_2 and O_2) on the ferromagnetic resonance has been studied. The experimental results for $LaNi_5$ confirm the well-known influence of small oxygen concentrations on the segregation process. After the addition of hydrogen in the case of such an 'activated' sample, a significant decrease of the effective magnetization is observed, which can be explained by the formation of magnetic 'dead layers', caused by adsorption of nickel segregates near the surface.

0803 Transport

1845 **(PB—82-205436) A study of the possibilities of converting gas transportation networks to hydrogen (etude des possibilities de conversion a l'hydrogene des reseaux de transport de gaz, rapport final). Final report.** Garat, M. (Commission of the European Communities, Luxembourg). [nd]. 82p. NTIS PC E05/MF E05.

Samples cut from tubes for the transportation of natural gas and from new tubes were subjected (1) to the test known as the 'delayed failure test' under hydrogen pressure up to the limit of the elasticity of steel; (2) to the rupture disk test under helium and hydrogen pressure. The results were specially analysed for the effect of welding, the influence of the degree of cracking, and the chemical composition. Account was taken of previous studies on the hydrogen embrittlement of steel. It was concluded from test (1) that the steels of the present gas network are sufficiently resistant to embrittlement by hydrogen of industrial purity. The results of test (2) meeting the most stringent demands for hydrogen purity and sample surface, confirmed the results of test (1). The conditions under which the present gas network may be used for the transportation of hydrogen are stated.

0804 Marketing And Economics

1846 **(CONF-820605—21) Hydrogen use in a rural Alaskan community.** Donakowski, T.D.; Blazek, C.F.; Novil, M.; Daniels, E.J. (Institute of Gas Technology, Chicago, IL (USA)). 1982. 10p. NTIS, PC A02/MF A01. Order Number DE83000568.

From World hydrogen energy conference; Pasadena, CA, USA (13 Jun 1982).

The results of a study to plan and design a program to demonstrate an all-hydrogen community in rural Alaska are discussed. The objectives of the study were to assess the prospects of reducing Alaska's dependency on fossil fuels by producing hydrogen

from renewable resources and easing the burden of transporting fuel to remote sites. The hydrogen system considers Alaska's unique resources, supply logistics, demographics, and economics. Integration of hydrogen production with transportation, distribution, storage, and utilization equipment is discussed for the representative rural village of Old Harbor on Kodiak Island. A 6-1/2 year demonstration program to prudently convert this village from diesel fuel to hydrogen is anticipated. As each phase is successfully completed, one aspect of the community's energy use and supply will be converted to an all-hydrogen. This includes equipment required for hydrogen production, residential hydrogen utilization, transportation, and electricity generation. In addition to technical requirements the paper describes the social, legal, and economic issues encountered in planning the demonstration. The total estimated cost of the demonstration, including equipment, management, monitoring and testing, is $20 million.

0808 Properties

REFER ALSO TO CITATION(S) 2547, 2556, 2704

1847 **(INIS-mf—7022) Diffusion of H and D in Nb and Ta at low temperatures.** Engelhard, J. (Technische Univ. Muenchen, Garching (Germany, F.R.). Fakultaet Physik). 25 Jul 1978. 23p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82780755.

Thesis.

The mobility of hydrogen and deuterium in niobium and tantalum has been studied by quenching to 4.2°K and annealing between 10 K and 100°K. The concentration of quenched hydrogen has been computed from the resistivity increase after quenching. The decrease of the residual resistivity during annealing is interpreted by the trapping of hydrogen and by the formation of precipitations. By the variation of the hydrogen concentration and the impurity content, the annealing stage corresponding to the intrinsic diffusion of the hydrogen has been identified. Diffusion coefficients and activation energies for H and D diffusion in niobium and tantalum were determined.

1848 **(SAND—82-8776) Hydrogen-nitrous oxide flame study.** Cattolica, R.J.; Smooke, M.D.; Dean, A.M. (Sandia National Labs., Livermore, CA (USA); Exxon Research and Engineering Co., Linden, NJ (USA)). Oct 1982. Contract AC04-76DP00789. 48p. (CONF-821035—3). NTIS, PC A03/MF A01. Order Number DE83002213.

From Combustion Insitute symposium on western states section; Livermore, CA, USA (11 Oct 1982).

Laser fluorescence and absorption spectroscopy have been used to investigate a stoichiometric H_2/N_2O flame stabilized on a porous plug flat flame burner at atmospheric pressure. Concentration profiles of OH, NH and NO, and the temperature profile were obtained. A detailed chemical kinetic mechanism which describes the flame chemistry was evaluated using a one-dimensional flame code which included multicomponent diffusional transport. This chemical kinetic mechanism was able to predict the observed OH, NH, and NO concentration levels within the experimental accuracy. These concentration levels were found to depend strongly on the two product channels of the $H + N_2O$ reaction: $N_2 + OH$ and $NH + NO$.

0809 Environmental Aspects

REFER ALSO TO CITATION(S) 1846

09 OTHER SYNTHETIC AND NATURAL FUELS

REFER ALSO TO CITATION(S) 3036

0901 Hydrocarbon Fuels

REFER ALSO TO CITATION(S) 1654, 1891, 1894, 1897, 1917, 1918, 1928, 1929, 1930, 1935, 1936, 1967, 2062, 2063, 2503, 2504, 2516, 2704

1849 **(DOE/ET/14759—T4-13a) Gasoline plant land requirements trade-off study report: preliminary design and assessment of a 50,000-BPD coal-to-methanol-to-gasoline plant.** (Grace (W.R.) and Co., Memphis, TN (USA)). Dec 1981. Contract FC02-80ET14759. 78p. NTIS, PC A05/MF A01. Order Number DE83000849.

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Based on a detailed analysis of the factors discussed in the report Parsons recommended Site Configuration A to Grace as most preferable for location of the Gasoline Plant. The costs of the three site configuration alternatives are judged to be of the same order of magnitude, although there are significant uncertainties with regard to certain of the cost elements for each alternative because of the preliminary nature of the estimates. The appraised values were established for each alternative on an equal basis. Some significant unknowns are described; other cost unknowns are due to uncertainties in the plant facilities layout which is in the developmental stage. From an environmental and ecological standpoint Configuration A requires the least amount of land considered to be prime farmland, but it requires the acquisition of the most residences. Nevertheless, from a socioeconomic standpoint, Configuration A was strongly preferred. Discussion with local leaders and public officials indicated a site configuration that maintained the site totally north of US 60 is greatly preferred. Grace concurs with the findings and recommendation and has authorized Parsons to initiate site design work on the basis of the Site Configuration A Alternative. Acquisition of options for the property constituting Configuration A has been started by Grace. Plans for the data collection for the Site Confirmation Report have begun.

1850 (DOE/ET/14759—T4-13a, pp 22p, paper 1) **Feasibility study for coal ash and slag disposal in orphan mine lands for the proposed coal gasification plant (Grace), Baskett, Kentucky.** Dec 1981. NTIS, PC A05/MF A01. Contract FC02-80ET14759.

In Gasoline plant land requirements trade-off study report: preliminary design and assessment of a 50,000-BPD coal-to-methanol-to-gasoline plant.

As a result of the systematic study and site reconnaissance, sites No. 8, 9, 10, 12 and 17 were found to be acceptable. Based on size, environmental, geologic, hydrologic and other factors contained in Tables II and III, site No. 10 was found to be the top ranked site with No. 9 a close second and No. 8 third in ranking. The quadrangle map is attached showing the site. The primary site is, therefore, the recommended satellite site for the waste disposal activities associated with the C-M-G plant near Baskett, Kentucky. Aerial photography followed by contact with the landowner regarding definition of the underground mining in the area, as well as site access would be the next steps in the site selection process towards obtaining a satellite site. During the course of this study concerning orphan lands, it was found that large tracts are almost invariably posted due to liability considerations since they belong to large mining companies such as Island Creek, Peabody, P & M, etc. Access is therefore not possible. One permitted landfill operator, Mr. Amos Shelton, of L.W.D., Inc., Calvert City, who contacted us regarding work at his Calvert City site, indicated that Peabody Coal Company, St. Louis, MO, and others were likely to have some suitable lands in their large holdings and may be approached to help in selection of a suitable coal cinder and ash disposal site. Mr. Shelton also indicated that he felt it was possible to contract for the disposal of coal ash and slag in mine pits with such operations being owned, permitted and operated by third party contractors such as himself. If further negotiations with landowners at the selected site No. 10 are not productive, these alternatives would certainly merit investigation.

1851 **(DOE/ET/14759—T7-36) Technical support report: preliminary design and assessment of a 50,000-BPD coal-to-methanol-to-gasoline plant.** (Grace (W.R.) and Co., Memphis, TN (USA). Agricultural Chemicals Group). Jul 1982. Contract FC02-80ET14759. 45p. NTIS, PC A03/MF A01. Order Number DE83000904.

The preliminary design and assessment of the W.R. Grace and Co. (Grace) Coal-to-Methanol-to-Gasoline Project was performed by The Ralph M. Parsons Company (Parsons) as a subcontractor to Grace under Cooperative Agreement No. DE-FC01-80ET-14759 between Grace and the US Department of Energy. In the performance of this work, it was necessary to obtain technical support from other companies because of the need for data on proprietary processes or other specialized expertise. Grace, prior to award of the subcontract to Parsons, had selected Texaco Development Corporation to supply the basic data for the Coal Gasification and Waste Heat Recovery, Coal Grinding and Slurry Preparation and the Effluent Water Treatment Facilities. They also had selected Mobil Research and Development Corporation to provide a process design and engineering data package for the Methanol-to-Gasoline, Heavy Gasoline Treating and Mobil Wastewater Treatment Facilities. This report describes the technical support provided to Parsons from process licensors, equipment suppliers, and consultants for use in the preliminary design of the Gasoline Plant. Prime consideration was given to the selection of processes and equipment that have been proven commercially.

1852 **(DOE/ET/14759—T9-27B) Materials and license report. Preliminary design and assessment of a 12,500 BPD coal-to-methanol-to-gasoline plant.** Stewart, R.M.; Timlin, K.R. (Grace (W.R.) and Co., Memphis, TN (USA); Parsons (Ralph M.) Co., Pasadena, CA (USA)). May 1982. Contract FC02-80ET14759. 117p. NTIS, PC A06/MF A01. Order Number DE83000846.

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In support of the operational planning for the Gasoline Plant, the Materials and Licenses Report (Deliverable 27B) addresses the eight subtasks that constitute Task 6 of the Statement of Work. They are: (1) plan for obtaining coal; (2) plan for obtaining electricity; (3) plan for obtaining water; (4) plan for obtaining materials and major supplies; (5) plan for use and disposition of products and by-products; (6) list of secrecy agreements and engineering licenses; (7) environmental regulations, construction codes and ordinances - other site related matters; and (8) plan for acquiring permits and licenses. Applicable information from a comparable report on the Synthesis Gas Demonstration Plant (SGDP), prepared under Contract No. DE-AC02-77ET-13042, was studied and utilized. The Plan for Obtaining Coal details coal requirements for the Gasoline Plant and summarizes methods to support these needs considering the type, source, and delivery of coal.

1853 **(DOE/ET/14759—T10-35) Technical support plan: preliminary design and assessment of a 50,000-BPD coal-to-methanol-to-gasoline plant.** (Grace (W.R.) and Co., Memphis, TN (USA). Agricultural Chemicals Group). Dec 1981. Contract FC02-80ET14759. 52p. NTIS, PC A04/MF A01. Order Number DE83000905.

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This volume defines the agreements and work to be done by vendor licensees (Texaco, Mobil, Ralph M. Parsons Co., Ruhrchemie, Air Liquide, Kennedy Van Saun, Lotepro, Lurgi (methanol synthesis), Phillips (hf alkylation), Dames and Moore (environmental effects data), Foster Wheeler, and US Army Corps of Engineers Lead Federal Agency for environmental impact statement). (LTN)

1854 **(DOE/ET/14809—11) Investigation of sulfur-tolerant catalysts for selective synthesis of hydrocarbon liquids from coal-derived gases. Quarterly technical progress report, March 19-June 18, 1982.** Bartholomew, C.H. (Brigham Young Univ., Provo, UT (USA)). 1 Jul 1982. Contract AC22-79ET14809. 28p. NTIS, PC A03/MF A01. Order Number DE83000310.

More active supported boride-promoted catalysts were prepared by heating less rapidly during reduction. Unsupported iron and 15% iron on silicalite catalysts were also prepared. Thermogravimetric analysis of prepared samples was also begun. Two silica supported catalysts derived from $Fe(CO)_5$ were tested. Both catalysts lost over half their initial activity within five hours, but both steady state activity and product selectivities are comparable with other iron catalysts. A silica-supported, boron-promoted cobalt catalyst was tested and exhibited a selectivity of 72% to C_5-C_{15} hydrocarbons at temperatures above 485°K. Data analysis was completed on in-situ poisoning tests. Exposure to 2 ppM H_2S resulted in much more rapid deactivation than exposure to 4 to 8 ppM H_2S. Deactivation at 525°K caused an increase in the C_2 olefin/paraffin ratio.

1855 **(DOE/PC/30021—T10) Catalyst and reactor development for a liquid-phase Fischer-Tropsch process. Quarterly technical progress report, 1 April 1982-30 June 1982.** Dyer, P.N.; Pierantozzi, R.; Brian, B.W.; Bauer, J.V. (Air Products and Chemicals, Inc., Allentown, PA (USA)). Aug 1982. Contract AC22-80PC30021. 156p. NTIS, PC A08/MF A01. Order Number DE83001279.

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Two major current tasks are: Slurry Catalyst Development, and Slurry Reactor Design Studies. Seven supported conventional catalysts, prepared with different metal precursors, concentrations, calcination procedures and supports, were tested in the gas phase to determine the effect of these parameters on activity and selectivity. A second slurry test of the baseline catalyst, sintered Fe_2O_3, utilized CO rich syngas to determine reactor mass transfer limitations. The product from 1.4:1 CO/H_2 approximated a straight line Schulz-Flory distribution, but higher CO/H_2 ratios gave increased high molecular weight material. Methane yields were low and high water gas shift activity gave a close match between syngas feed and usage ratios. At $T > 250°C$ some mass transfer effects were observed, and are being incorporated into a reactor model. Six additional slurry tests used supported molecular cluster catalysts. Initially in this series, slurry phase activities were low. A slurry test of one supported cluster showed marked deviations from the standard Schulz-Flory distribution in the C_{10}-C_{20} region, but at very low conversion. Subsequent supported cluster catalyst tests led to a method of obtaining high slurry phase activities equal to the gas phase. A slurry test of another cluster catalyst utilizing this method gave high activity, but did not reproduce the product selectivity for C_{10}-C_{18} observed in its previous gas phase test. At higher pressure, 750 psig, and 280°C, however, methane yields decreased, becoming independent of the CO/H_2 ratio, and the Schulz-Flory product distribution became nonlinear with a definite cutoff at ~ C_{20}. Two supported cluster catalysts were prepared and seven were screened in the gas phase.

1856 **(DOE/PC/40771—6) Fischer-Tropsch synthesis in slurry-reactor systems. Quarterly report, August 1, 1982-October 31, 1982.** Satterfield, C.N.; Bartos, T.; Stenger, H. (Massachusetts Inst. of Tech., Cambridge (USA)). 1982. Contract FG22-81PC40771. 20p. NTIS, PC A02/MF A01. Order Number DE83001740.

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An Mn/Fe catalyst prepared at the Technical University of Berlin was studied under a set of conditions chosen to compare the results with a reduced fused magnetite catalyst and with a similar catalyst studied by Deckwer et al. (I.E.C. Proc. Des. Dev., 21, 222 (1982)). The results are presented in the form of a manuscript attached herewith that has been submitted to the same journal for publication. The pattern of product selectivity with the Mn/Fe catalyst was very similar to that observed with a reduced fused magnetite catalyst in the same apparatus, but the olefin/paraffin ratio at all carbon numbers was less than that with the reduced magnetite catalyst. With both catalysts the Flory-Schultz distribution was followed but two values of the chain growth probability, α, were found, with a sharp discontinuity at about C_{11}. α values based on the C_1-C_{10} products were less for the Mn/Fe catalyst than for the fused Fe catalyst, attributed to the absence of potassium in the Mn/Fe catalysts.

1857 (DOE/PC/40771—6, pp 17p, Paper 2) **Fischer-Tropsch synthesis on a precipitated Mn/Fe catalyst in a well-mixed slurry reactor.** Satterfield, C.N.; Stenger, H.G. (Massachusetts Inst. of Tech., Cambridge, MA). 1982. NTIS, PC A02/MF A01.

In Fischer-Tropsch synthesis in slurry-reactor systems. Quarterly report, August 1, 1982-October 31, 1982.

The pattern of product selectivity was very similar to that observed with a reduced fused magnetite catalyst in the same apparatus, but the olefin/paraffin ratio at all carbon numbers was less than that with the reduced magnetite catalyst. With both catalysts the Flory-Schultz distributin was followed but two values of the chain growth probability, α, were found, with a sharp discontinuity at about C_{11}. α values based on the C_1-C_{10} products were less for the Mn/Fe catalyst than for the fused Fe catalyst, attributed to the absence of potassium in the Mn/Fe catalyst. The activity of the present Mn/Fe catayst was moderately less than that reported for a similar catalyst studied elsewhere in a bubble column.

1858 (NRAES—13) **Methane technology for agriculture.** (Northeast Regional Agricultural Engineering Service, Ithaca, NY (USA)). 1981. 213p. (CONF-8103138—). Northeast Regional Agricultural Engineering Service, Ithaca, NY 14853.

From Methane technology for agriculture conference; Ithaca, NY, USA (17 Mar 1981).

This volume contains the eighteen papers presented at the Methane Technology for Agriculture Conference collected under the headings: digester design and construction; operation of an anaerobic digester; utilization of biogas on the dairy; and economics of biogas production. Separate abstracts were prepared for selected papers.

1859 (NRAES—13, pp 32-46) **Engineering, economics, and management of a swine manure digester.** Fischer, J.R.; Iannotti, E.L.; Fulhage, C.D. (Univ. of Missouri, Columbia). 1981. Northeast Regional Agricultural Engineering Service, Ithaca, NY 14853.

From Methane technology for agriculture conference; Ithaca, NY, USA (17 Mar 1981).

The microbiology and biochemistry of converting swine manure to methane is discussed. Recommended design parameters for a swine manure digester are: loading rate, 4 g VS $l^{-1}day^{-1}$, where VS = volatile solids; temperature of digesting slurry, 30 to 35°C; and detention time, 15 days. The recommended procedure for starting a digester is loading at 2.5 g VS $l^{-1}day^{-1}$ and increasing the loading rate of 0.8 g VS $l^{-1}day^{-1}$ at weekly intervals. A model pork production system was developed in which an anaerobic digester supplies 93% of the thermal energy needs and 100% of the electrical energy requirements of the buildings. An economic analysis of this system indicated that a $21,000 investment in the digester could be amortized in 12 years with a 10% return on investment if electricity costs $0.04/kWh and propane costs $0.15/l.

1860 (NRAES—13, pp 65-105) **Comparison of anaerobic digester designs.** Groen, G. (Carl Bro International, Denmark). 1981. Northeast Regional Agricultural Engineering Service, Ithaca, NY 14853.

From Methane technology for agriculture conference; Ithaca, NY, USA (17 Mar 1981).

The Ministry of Energy of Denmark has erected three full-scale biogas demonstration plants on existing farms as part of its research and development program to produce biogas from animal wastes. The design, gas utilization, construction costs, operation, performance, and economic analysis of these three plants are detailed.

1861 (NRAES—13, pp 106-113) **Summary of European experience with anaerobic digesters.** Gron, G. 1981. Northeast Regional Agricultural Engineering Service, Ithaca, NY 14853.

From Methane technology for agriculture conference; Ithaca, NY, USA (17 Mar 1981).

The known biogas plants of Denmark (21), Sweden (2), Norway (1), Finland (2), Switzerland (16), West Germany (5), Austria (1), The Netherlands (2), and the United Kingdom (6) are listed. The tables give the type of farm, quantity of manure available, the digester type, size, and construction material, type of gas storage, the energy conversion process, production rate, and whether the biogas plant is still in operation.

1862 (NRAES—13, pp 114-136) **Matching dairy farm energy use and biogas production.** Koelsch, R.; Walker, L.P. 1981. Northeast Regional Agricultural Engineering Service, Ithaca, NY 14853.

From Methane technology for agriculture conference; Ithaca, NY, USA (17 Mar 1981).

A systems analysis is presented which examines the energy needs of three dairy farms (50, 100, and 300 cows) and the potential of an anaerobic digester to replace part or all of these needs. The ability of biogas to replace liquid fuels appears minimal. However, using the biogas for water heating, cooking, space heating, and/or generating electricity is an attractive potential. Conservation, load scheduling, and costs are included in the discussion and analysis.

1863 (NRAES—13, pp 149-157) **Biogas filtration and storage.** Heisler, M. (Cornell Univ., Ithaca, NY). 1981. Northeast Regional Agricultural Engineering Service, Ithaca, NY 14853.

From Methane technology for agriculture conference; Ithaca, NY, USA (17 Mar 1981).

Typical biogas being produced in a farm-scale anaerobic digester is composed of about 60% methane, 40% CO_2, and less than 1% water vapor, H_2S, and mercaptans. Although CO_2 is not useable as a fuel and its presence increases storage and gas moving requirements, the expense of commercial equipment for its removal cannot be justified. Water vapor forms acids with the CO_2 and H_2S in the biogas; however, commercial filters which remove both are available at reasonable costs. When considering storage of biogas, safety precautions due to corrosion of equipment, handling of poisonous and flammable gas, and pessurization of equipment must be considered. It is advisable to store only one day's production of biogas. The pressure of the system, the location of the storage facilities, and scheduling of peak production to coincide with peak demand are discussed.

1864 (NRAES—13, pp 173-174) **Safe production and utilization of methane.** Baker, L.D. (Cornell Univ., Ithaca, NY). 1981. Northeast Regional Agricultural Engineering Service, Ithaca, NY 14853.

From Methane technology for agriculture conference; Ithaca, NY, USA (17 Mar 1981).

1865 (NRAES—13, pp 178-207) **Economics of plug flow methane reactors.** Jewell, W.J.; Dell'Orto, S.; Fanfoni, K.J.; Kabrick, R.M. (Cornell Univ., Ithaca, NY). 1981. Northeast Regional Agricultural Engineering Service, Ithaca, NY 14853. Contract AC02-76ET20051.

From Methane technology for agriculture conference; Ithaca, NY, USA (17 Mar 1981).

The successful operation of a low cost small dairy farm anaerobic methane fermentor for three years in a cold climate provides incentive for farmers to consider adopting this technology. Extensive full sale parallel operations showed that the simple plug flow reactor out-performed the more expensive conventional completely mixed system. Although the economic feasibility of biogas generation is highly site specific, assumptions were made to separate these variables from those common to dairies with sizes ranging from 25 to 500 head. Computer models were developed to examine the energy flow in the system as it is affected by major design variables, such as insulation, and to relate the major design decisions to the overall cost and the unit energy cost of the system. The values for all major parameters (energy flow, insulation effectiveness, biogas generation characteristics, materials cost, etc.) were verified with the two-full scale systems operated at Cornell University. For all farm sizes considered, the cost of energy production is less than the cost of existing conventional sources.

1866 **(PB—82-214347) Kinetics and catalysis of producing synthetic gases from biomass. Annual report Dec 80-81.** Sealock, L.J. Jr; Elliott, D.C.; Hallen, R.T.; Barrows, R.D.; Weber, S.L. (Battelle-Northwest, Richland, WA (USA). Pacific Northwest Lab.). Dec 1981. 175p. NTIS, PC A08/MF A01.

Battelle Pacific Northwest Laboratories is conducting basic research to provide a fundamental elucidation of the kinetics, reac-

tion sequences and pathways involved in pyrolysis and catalytic steam gasification of wood and wood components. A one liter stirred autoclave was used to study gasification in a low temperature regime (100C-450C). The autoclave has been successfully modified to allow remote sampling of the liquid and gaseous phases present in the reaction environment. A two-inch diameter batch reactor is being used to study gasification at higher temperatures (550C-850C). Kinetic studies of the gasification reactions relative to cellulose, holocellulose, lignin, and Douglas fir gasification have been completed. Reaction rate constant and activation energies were determined for catalyzed and uncatalyzed cases. The formation of specific compounds during gasification in the presence and absence of catalysts was investigated in both reactor systems. Results of the low and high temperature experiments have demonstrated dramatic differences in the kinetics and gas composition as a function of the various catalyst cases and components tested. A report of the second year's work effort of the three year project is included.

1867 **Catalyst for converting synthesis gas to light olefins.** Gormley, R.J.; Rao, V.U. (to Department Of Energy). US Patent 4,340,503. 20 Jul 1982. Filed date 15 Aug 1980. vp.

PAT-APPL-178654.

A catalyst and process are disclosed for the catalytic hydrogenation of carbon monoxide. A silicalite support substantially free of aluminum is soaked in an aqueous solution of iron and potassium salts. The iron and potassium are present in concentrations such that the dried silicalite has iron present in the range of from about 5 to about 25 percent by weight and has potassium present in an amount not less than about 2 percent by weight. Thereafter the silicalite is dried and combined with amorphous silica, a binder for pellets. The catalytic pellets are then used to convert synthesis gas to C_2-C_4 olefins.

1868 **Heat treatment and anaerobic digestion of refuse.** Gossett, J.M.; Stuckey, D.C.; Owen, W.F.; McCarty, P.L. (Cornell Univ, Ithaca, NY, USA). *Journal of the Environmental Engineering Division, ASCE (American Society of Civil Engineers);* **108**: No. EE3, 437-454(Jun 1982).

Alkaline heat treatment is evaluated as a pretreatment process for increasing the anaerobic digestibility of municipal refuse. Batch digestibility assays were employed to ascertain the separate effects of solids concentration, sodium hydroxide concentration, and temperature (25-250C°) on the methane yield from refuse. Consumption of added alkali was observed and found to be relatively constant per unit mass of refuse solids. Various semi-continuous reactor configurations were evaluated.

1869 **Modeling toxicity in methane fermentation systems.** Parkin, G.F.; Speece, R.E. (Drexel Univ, Philadelphia, PA, USA). *Journal of the Environmental Engineering Division, ASCE (American Society of Civil Engineers);* **108**: No. EE3, 515-531(Jun 1982).

The paper deals with wastewater treatment using anaerobic methane fermentation. Three models describing toxicity phenomena are given to help develop more rational design and operational strategies. The first model describes the recovery pattern of methane fermentation systems from slug addition of toxicants as a function of toxicant type and concentration, and time. This model allows for prediction of periods of zero gas production and threshold toxicant concentrations. The second two models incorporate the effect of toxicity on the fundamental Monod-type expressions. 12 refs.

0902 Alcohol Fuels

REFER ALSO TO CITATION(S) 1849, 1852, 1893, 1901, 1902, 1903, 1904, 1905, 1906, 1907, 1908, 1909, 1910, 1915, 1916, 1917, 1918, 1919, 1920, 1921, 1922, 1923, 1931, 1935, 1967, 1971, 2545, 2704

0904 Solid Waste And Wood Fuels

REFER ALSO TO CITATION(S) 1892, 2519

0905 Liquid Waste Fuels

1870 **(AD-A—113488/1) Waste vegetable oil as a fuel extender. Final report.** Thompson, J.F. Jr. (Army Facilities Engineering Support Agency, Fort Belvoir, VA (USA). Technology Support Div.). Oct 1981. 44p. NTIS, PC A03/MF A01.

This report presents the conditions under which waste hydrogenated vegetable oil can be mixed with waste and virgin petroleum oils and remain in a homogeneous state.

13 HYDRO ENERGY

1871 **(EGG-HYD—6024) Status of DOE small hydropower research and development projects.** Magleby, E.H.; Rinehart, B.N.; Chappell, J.R. (eds.). (Idaho National Engineering Lab., Idaho Falls (USA)). Oct 1982. Contract AC07-76ID01570. 26p. NTIS, PC A03/MF A01. Order Number DE83001353.

The results and the status of DOE small hydropower R and D projects are presented. Also included is an updated bibliography of completed reports. In most cases, reports are published to make available the research, engineering, operating, regulatory or cost information from the projects that are pertinent to hydropower development by private and nonfederal government sectors. The bibliography also presents information for ordering the reports listed.

1301 Resources And Availability

1872 **(AD-A—113569/8) Reconnaissance report for hydropower redevelopment at Salt Ste. Marie, Michigan.** (Corps of Engineers, Detroit, MI (USA). Detroit District). Jan 1981. 558p. NTIS, PC A24/MF A01.

This report document reconnaissance stage investigations completed by the Corps of Engineers on the feasibility of hydropower facilities redevelopment at Sault Ste. Marie, Michigan. While continued growth in demand for energy in the Michigan Upper Peninsula is anticipated, existing hydropower capacity has been unable to keep pace with current demand. In addition, a new Canadian hydropower plant is scheduled to go on line in 1982. At that time, water which the United States has traditionally used will be reduced. This reduction in available water will result in lower energy production, and in a further widening of the gap between hydroelectric supply capacity and demand. The authorization for the study is provided under Section 102 of the River and Harbor Act of 1966. The purpose of the study is to determine the overall economic, engineering, environmental, and social feasibility of hydropower facilities redevelopment in United States waters at Sault Ste. Marie, Michigan, and to determine the extent of any recommended Federal participation. After preliminary screening, four of the alternatives were developed to a greater level of detail. Evaluation of these alternatives indicated that whereas under one without project condition, all the alternatives would be economically feasible, under another without project condition, none of the alternatives would be feasible.

1302 Site Geology And Meteorology

REFER ALSO TO CITATION(S) 1874

1303 Plant Design And Operation

1873 **(DOE/RA/23210—2) DOE small-scale hydroelectric demonstration program. James River-New Hampshire Electric, Inc., sawmill hydrostation redevelopment. Final report.** (James River Corp., Berlin, NH (USA). Engineering Dept.). Aug 1982. Contract FC07-79RA23210. 190p. NTIS, PC A09/MF A01. Order Number DE83000446.

Portions of document are illegible.

This project is one of the US DOE's twenty-one (21) Small-Scale Hydroelectric Demonstration Projects. The purpose for the demonstrations is to determine the feasibility of potential small hydroelectric power development projects at a variety of existing dam sites across the country. The Sawmill Power Station in Berlin, New Hampshire, provided an excellent example of the redevelopment of a discontinued low-head hydroelectric facility. The project was undertaken during a period of rising energy prices and acute shortages of thermally generated power, particularly for the commercial sector. The power generated from this facility will serve to reduce James River Corporation's dependence on outside utility-generated power and will be transmitted to Company mills through an existing transmission and distribution line system. As the cost of utility-purchased power has increased over the last several years, the economic viability of the redevelopment project was assured. Brown-New Hampshire, Inc., the original company that started this redevelopment project in 1979, was a wholly-owned subsidiary of Brown Company and was responsible for fulfilling the energy requirements for Brown Company. Originally, Brown-New Hampshire was awarded a cooperative agreement where the Department of Energy would share in 25% of the construction costs. The proposer contributed valuable amounts of their own time to the project and will assume the entire financial responsibility for operation and maintenance of the station during the two-year monitoring period. James River-New Hampshire Electric, Inc. has prepared this comprehensive project report for submission to the Department of Energy and dissemination to the public.

1305 Economics And Management

REFER ALSO TO CITATION(S) 2528

1874 **(AD-A—112150/8) Stage 2 hydropower study: Cagles Mill Lake, Indiana.** (Army Engineer District, Louisville, KY (USA)). Jul 1981. 51p. NTIS, PC A04/MF A01.

The principle planning objective was the development of a renewable resource energy production facility for Cagles Mill Lake and the surrounding study area to be of benefit for a 100-year period of analysis. All plans studied are economically infeasible due primarily to the cost of the conveyance system needed to deliver the water to the powerhouse. The maximum capability of a house power unit in the center gate opening of the control tower is almost 250 KW. It is recommended that the study of the feasibility of small scale hydropower at Cagles Mill Lake, Indiana be terminated. It is recommended that a small station power unit, having an installed capacity of about 250 KW, be designed and installed in the existing tower at the earliest possible date to provide power for project facilities.

1875 **(PB—82-197971) Aggregation-disaggregation techniques for the operation of multi-reservoir systems. Doctoral thesis.** Smith, R.A. (Colorado State Univ., Fort Collins (USA). Water Resources Research Inst.). 1981. 235p. NTIS, PC A11/MF A01.

The analysis of the best allocation of the total amount of water available in an aggregated or equivalent reservoir into a multi-reservoir system is performed using the Kuhn-Tucker theorem of mathematical programming. The cases of systems in parallel and in series are specifically studied. It is shown that the optimal allocation is obtained when the marginal benefits of the water in storage is the same at each reservoir. The yield optimally defined for the aggregated system (a relaxed system) represents an upper bound in yield production for the multi-reservoir system. The various Aggregation-Disaggregation techniques have been applied to four cases: a water supply system of three reservoirs in parallel; the North Platte water supply system of seven reservoirs in series, a hydropower system of four reservoirs in parallel, and a hydropower system in Brazil composed of six reservoirs and eight power plants.

1306 Environmental Aspects

1876 **(FERC/EIS—0031) Final Environmental Impact Statement: A.J. Wiley Project, FERC No. 2845-Idaho.** (Federal Energy Regulatory Commission, Washington, DC (USA). Office of Electric Power Regulation). Sep 1982. 491p. NTIS, PC A21/MF A01. Order Number DE83001832.

Portions of document are illegible.

The Idaho Power Company (Applicant) of Boise, Idaho, proposes to construct a hydroelectric project with an installed generating capacity of approximately 86 MW on the Snake River in Twin Falls and Gooding Counties, Idaho. The proposed project would consist of: (1) Wiley Dam, a 680-ft-long, 100-ft-high, earth-filled embankment with an impervious core and rock surface, containing a 175-ft-wide, concrete, ogee spillway, located on the north abutment, and controlled by three 45-ft-wide and 35-ft-high Taintor gates; (2) a reservoir, which would extend to the tailwaters of the existing Lower Salmon and Lower Malad Powerplants of FERC Projects Nos. 2061 and 2726, respectively, with a gross storage capacity of 24,000 acre-ft and a surface area of 625 acres at elevation 2735 mean sea level (msl); and (3) a concrete intake structure within the dam, south of the spillway, forming a monolithic structure, with: a reinforced concrete powerhouse located below the dam; a 13.8- to 138-kV, 3-phase transformer and switching structures, adjacent to the powerhouse; and a 3-mile-long transmission line connecting the proposed powerhouse to the Applicant's existing transmission line, south of the project site. Applicant states that the Bliss Bridge and adjacent portions of Shoestring Road would be inundated by the proposed project. Applicant proposes to build a new bridge at a point 1500 ft down-stream of the proposed dam, and to reroute and reconstruct the inundated portions of the road.

14 SOLAR ENERGY

1401 Resources And Availability

1877 **(LBL—14913) Summary of results of spectral and angular sky radiation measurement program.** Martin, M.; Berdahl, P. (Lawrence Berkeley Lab., CA (USA)). Aug 1982. Contract AC03-76SF00098. 13p. (CONF-820940—4). NTIS, PC A02/MF A01. Order Number DE83001553.

From Passive and hybrid solar energy update conference; Washington, DC, USA (15 Sep 1982).

Portions of document are illegible.

Results are analyzed and plotted for a series of more than 50 thousand spectral infrared sky radiation measurements made in 6 US cities. An empirical equation is developed to disaggregate the total sky emissivity into its spectral and angular components. This information is of special relevance to the performance of radiative cooling systems.

1878 **(SERI/TP—254-1711) Models for generating daylight and sunlight availability data for the United States.** Robbins, C.L.; Hunter, K.C. (Solar Energy Research Inst., Golden, CO (USA)). Sep 1982. Contract AC02-77CH00178. 14p. (CONF-820940—3). NTIS, PC A02/MF A01. Order Number DE83000120.

From Passive and hybrid solar energy update conference; Washington, DC, USA (15 Sep 1982).

Portions of document are illegible.

The exteroir illuminance level and the frequency and duration of sunlight are important elements in the design, analysis, and evaluation of daylighting systems in buildings. The daylighting laboratory of the Solar Energy Research Institute (SERI) is establishing daylight and sunlight availability data for select US cities. An overview of the mathematics and a sample of the daylight and sunlight availability data are presented.

1879 **(SOLAR/0010—82/09) September 1982 environmental data for sites in the National Solar Data Network.** (Automation Industries, Inc., Silver Spring, MD (USA). Vitro Labs. Div.). Sep 1982. Contract AC01-79CS30027. 65p. NTIS, PC A04/MF A01. Order Number DE83001839.

Environmental data are tabulated for 14 sites. The data include insolation, temperature, wind, and relative humidity data. Also included is a technical discussion of the instruments used in taking the data. (LEW)

1880 **Quality control for solar radiation data.** Wendler, G.; Eaton, F.D. (Alaska, University, Fairbanks, Alaska). *Solar Energy;* **25**: No. 2, 131-138(1980). Contract FG06-77ET20181.

Solar radiation values are difficult to predict or to estimate, due to the multitude of factors affecting radiative transfer in the atmosphere. Whether considering a network of stations or several radiation sensors at a single station, proper calibration procedures of both sensors and data acquisition systems are mandatory. This paper presents a method whereby the interrelationships of signals received from different radiometers at a single site are systematically checked as a means of data control. The various measurements discussed include direct solar, global, diffuse solar and net radiation, albedo, measurements on inclined surfaces and in various bandpasses. The data control method is accomplished by examining ratios, combinations, and comparisons of various measured parameters in addition to calculating some of these parameters by the use of empirical formulae.

1881 **(PB—82-198839) Short interval meteorological data for computational methods. Final report.** Koch, H.R.; Gruter, J.W. (Commission of the European Communities, Luxembourg). [nd]. 34p. NTIS PC E03/MF E03.

The fundamental question of validation of computational methods for the determination of the energy output of solar energy collectors is discussed. In the first part, the question of the necessary length of time intervals of meteorological measurements is studied with the help of a dynamic collector description in terms of finite elements. In the second part of the work meteorological data were measured at intervals of 10 minutes during the years 1978 and 1979. The measurement of global radiation on inclined surfaces was included.

1882 **(PB—82-200197) Climatology of solar irradiance on inclined surfaces; part 1. Final report.** Slob, W.H.; Brethouwer, D.E.; Den Ouden, C. (Commission of the European Communities, Luxembourg). [nd]. 84p. NTIS PC E05/MF E05.

The following solar input variables were measured from March 1979 to October 1979 in Cabauw in the Netherlands: (1) the global solar irradiance, with an Eppley pyranometer, for five different orientations; (2) the direct solar irradiance on a surface perpendicular to the sunbeam, with an Eppley pyrheliometer; and (3) the ground-reflected solar irradiance, with an Eppley pyranometer in the inverted position.

1883 **(PB—82-200510) Predetermination of irradiation on inclined surfaces for different European centres.** Page, J.K.; Rodgers, G.G.; Souster, C.G.; Le Sage, S.A.; Thompson, J.L. (Commission of the European Communities, Luxembourg). [nd]. 233p. Commission of the European Communities, Luxembourg.

Irradiation has been studied at 26 sites throughout Europe and comparisons made of observed and predicted monthly mean daily and hourly irradiation of slopes. The AVDY model has been shown to be accurate for inclined surface data from a wide range of stations. In its present form, the constant turbidity model gave better results for stations with clear atmospheres than the Kew turbidity model which gave better results for typical EEC conditions. Suggestions are made to improve the constant turbidity model and the quality of the external data.

1403 Economics

REFER ALSO TO CITATION(S) 2004, 2011, 2435

1884 **(SAND—82-2219C) Residential photovoltaic systems: results and issues.** Jones, G.J.; Biringer, K.L. (Sandia National Labs., Albuquerque, NM (USA)). 1982. Contract AC04-76DP00789. 4p. (CONF-820906—9). NTIS, PC A02/MF A01. Order Number DE83001032.

From 16. IEEE photovoltaics specialists conference; San Diego, CA, USA (28 Sep 1982).

If the photovoltaic system in a residential application is viewed as dedicated to the household loads, the on-site energy use becomes the key factor in system design. However, the basis for this viewpoint is that the backup electricity cost to the homeowner is independent of the PV system's presence. This assumption appears invalid if the utility's perception of distributed energy generators is analyzed. If a PV system is to reflect long term utility action, then the value of PV generated energy must be based on utility avoided cost independent of the point of final energy use. In this paper we discuss this perspective and show how it leads to a realization that residential system designs are independent of on-site load and direct use fraction.

1885 **(SAND—82-2220C) Future contingencies and photovoltaic system worth.** Jones, G.J.; Thomas, M.G.; Bonk, G.J. (Sandia National Labs., Albuquerque, NM (USA); General Electric Co., Schenectady, NY (USA)). 1982. Contract AC04-76DP00789. 6p. (CONF-820906—8). NTIS, PC A02/MF A01. Order Number DE83001033.

From 16. IEEE photovoltaics specialists conference; San Diego, CA, USA (28 Sep 1982).

The value of dispersed photovoltaic systems connected to the utility grid has been calculated using the General Electric Optimized Generation Planning program. The 1986 to 2001 time period was used for this study. Photovoltaic systems were dynamically integrated, up to 5% total capacity, into 9 NERC based regions under a range of future fuel and economic contingencies. Value was determined by the change in revenue requirements due to the photovoltaic additions. Displacement of high cost fuel was paramount to value, while capacity displacement was highly variable and dependent upon regional fuel mix.

1886 **National goals for solar energy: economic and social implications.** Bezdek, R.H. (Dept. of the Treasury, Washington, DC); Wendling, R.; Bennington, G.E.; Chew, H.R. *Natural Resources Journal;* **22**: No. 2, 337-360(Apr 1982).

The purpose of this paper is to analyze the likely costs and benefits of providing 20% of US energy requirements from solar energy by the year 2000. The implications are detailed for specific solar-energy technologies and market sectors of the economy. A major national commitment is necessary to resolve the obstacles hindering commercialization, but accelerating the use of solar energy will save nonrenewable resources, reduce the life-cycle cost of energy demand, and reduce long-run pollution. It will also enhance energy security and increase world stability and national security. Solar energy is especially appropriate in developing countries. Perhaps the most important argument is the need for a secure and readily available supply of energy to guarantee economic growth. The authors feel the 20- to 30-year lead time needed to develop energy technologies warrants the same federal assistance for solar that was given to nuclear power. 33 references, 6 figures, 4 tables.

1404 Environmental, Legal, And Institutional Aspects

REFER ALSO TO CITATION(S) 2336

1887 **(DOE/CH/10122—4) Final report on SSEC programs conducted with state agencies.** (ESG, Inc., Atlanta, GA (USA)). Aug 1982. Contract AC02-82CH10122. 60p. NTIS, PC A04/MF A01. Order Number DE82021290.

In July 1979, the Southern Solar Energy Center (SSEC) initiated the State Solar Support (SSS) Project. By creating a formalized linkage with lead energy agencies in each of the 19 SSEC jurisdictions, the project complemented other SSEC programmatic activities and enhanced the capabilities of the state agencies to conduct solar programs. This report describes the State Solar Support Project and documents selected accomplishments and activities. The objectives and approach of the project and SSEC efforts to support project activities are described. The impact and accomplishments in each jurisdiction attributed in part to the State Solar

Support Project are summarized. Selected examples of project materials and activities are provided.

1888 **(DOE/CH/10122—5) Summary of SSEC information activities, October 1981-May 1982.** (ESG, Inc., Atlanta, GA (USA)). Sep 1982. Contract AC02-82CH10122. 28p. NTIS, PC A03/MF A01. Order Number DE83001148.

Portions of document are illegible.

In the period October 1, 1981 through May 31, 1982, the Information Services Group of the Southern Solar Energy Center processed 2112 inquiries on solar energy. Approximately 74 percent of these inquiries came from solar and building industry professionals. It should be recognized that a large number of additional inquiries were also handled by other SSEC technical staff in their contacts with the professional and technical community. This report documents SSEC's efforts in providing technical information and responding to information inquiries. A general overview of SSEC's information activities is presented, providing an inquirer profile, discussing how inquiries were received, outlining how inquiries were processed and recorded, and reviewing materials used in responding to inquiries. A brief analysis of inquiries by subject category is provided.

1405 Solar Energy Conversion

REFER ALSO TO CITATION(S) 1841, 1858, 1860, 1862, 1863, 1864, 1865, 1866, 1998, 2002, 2020, 2021, 2062, 2063, 2503, 2504, 2519, 2545, 2661, 2692, 3054

1889 **(AD-A—112038/5) Ribbon growth of single crystal GaGs for solar cell application. Final report, 15 August 1978-15 August 1981.** Gould, T.A.; Seidensticker, R.G.; Mazelsky, R. (Westinghouse Electric Corp., Pittsburgh, PA (USA). Research and Development Center). Nov 1981. 77p. NTIS, PC A05/MF A01.

Described are the results of a 3-year effort to develop GaAs dendritic web for high-efficiency solar cells. A unique GaAs ribbon growth system was developed by applying dentritic-web growth techniques to a liquid-encapsulated GaAs system. Computerized thermal modelling and experimental modification produced a thermal geometry from which 48 GaAs webs were grown. These crystals had a multidendrite and/or faceted morphology rather than typical web morphology. Crystal quality improved as thermal geometry, growth techniques, dendrite seeds, and melt chemistry were optimized during the course of the program; however, conventional web morphology was not achieved. Analyses of chemical modification, crystal-growth characteristics, and orientation relationships suggest that inherent materials properties of GaAs produce a typical web morphology under conventional web-growth conditions. Consequently, a simple transfer of Si web growth technology to our GaAs system was inadequate for the growth of high quality GaAs web.

1890 **(AD-A—113756/1) Preparation and photoelectronic properties of $FeWO_4$. Technical report.** Sieber, K.; Kourtakis, K.; Kershaw, R.; Dwight, K.; Wold, A. (Brown Univ., Providence, RI (USA). Dept. of Chemistry). 15 Apr 1982. 14p. NTIS, PC A02/MF A01.

Single crystals and polycrystalline samples of $FeWO_4$ were prepared and characterized. From high temperature paramagnetic data, the presence of high spin state Fe(+2)(3d6) was confirmed. Qualitative Seebeck measurements indicated p-type conductivity. The measured room temperature resistivity of single crystals was approx. 100 ohm-cm with an activation energy of .16(2) eV. No appreciable photocurrents were found in 0.2M NaAc at pH = 8.3.

1891 **(ANL/CNSV—31) Methane from landfills: preliminary assessment workbook.** Wilkey, M.L.; Zimmerman, R.E.; Isaacson, H.R. (Argonne National Lab., IL (USA)). Jun 1982. Contract W-31-109-ENG-38. 30p. NTIS, PC A03/MF A01. Order Number DE83002319.

System options for developing landfill gas recovery projects are discussed. The report also presents factors affecting the economics of each option. Sample calculations and worksheets are included to assist in the process of making preliminary judgments about production and revenue potentials for landfill gas recovery at a specific site.

1892 **(ANL/EES-TM—189) Technology assessment of solar energy systems: direct combustion of wood and other biomass in industrial boilers.** Abelson, H.I.; Habegger, L.J.; Liu, B.C. (Argonne National Lab., IL (USA)). Dec 1981. Contract W-31-109-ENG-38. 33p. NTIS, PC A03/MF A01. Order Number DE83000937.

The cost, resource requirements, and environmental characteristics of a model combustion system sized to handle an annual feed of 12,500 dry tons of forest residue are evaluated. The cost of the wood combustion system is comparable to that of coal-fired boilers in industry. Atmospheric emissions of the wood system are lower in sulfur dioxide than those of coal systems, but emissions of particulate matter are potentially higher. However, the combined use of multicyclones and wet scrubbers can reduce these emissions to levels produced by coal systems. Cost and environmental characteristics of boilers that burn sugarcane bagasse are compared to those of wood-fired boilers because the two systems are similar.

1893 **(ANL/SPG—21) Impact of increased grain alcohol production on agriculture: a simulation study.** Webb, S.B. (Argonne National Lab., IL (USA)). Sep 1982. Contract W-31-109-ENG-38. 12p. NTIS, PC A02/MF A01. Order Number DE83002316.

The US Dept. of Agriculture's simulation model, NIRAP, is used to predict how US agriculture would react over the next two decades to large increases in demand for alcohol, increases large enough to replace about 10% of current gasoline consumption. Alcohol production is assumed to require corn as the input and to produce distillers dry grain, which substitutes for soybeans, as a by-product. Each additional billion gallons of annual alcohol production drives up the price of corn about 4%, drives down the price of soybeans about 1%, and raises the net incomes of farmers about 1.5%.

1894 **(BNL—51560) Flash pyrolysis of biomass with reactive and non-reactive gases.** Steinberg, M.; Fallon, P.T. (Brookhaven National Lab., Upton, NY (USA)). Jun 1982. Contract AC02-76CH00016. 22p. NTIS, PC A02/MF A01. Order Number DE83001850.

The rapid or flash pyrolysis of wood biomass is being studied in a 1" downflow entrained tubular reactor with a capacity of approximately 1 lb/hr of wood. The process chemistry data is being obtained with the view of building a data base and ascertaining the value of producing synthetic fuels and chemical feedstocks by the flash pyrolysis method. Data is being obtained on the effect of non-reactive pyrolyzing gases and the effect of reactive gases, hydrogen for the flash hydropyrolysis of wood and methane for flash methanolysis of wood. Preliminary process design and analysis has been made. The yield of ethylene and benzene is especially attractive for the production of chemical feedstocks from the reaction of methane and wood in a flash methanolysis process.

1895 **(CONF-820605—22) Improved photoanodes for photoelectrolysis.** Richardson, P.F.; Ang, P.G.P.; Sammells, A.F. (Institute of Gas Technology, Chicago, IL (USA)). 1982. 16p. NTIS, PC A02/MF A01. Order Number DE83900078.

From World hydrogen energy conference; Pasadena, CA, USA (13 Jun 1982).

Photocurrents of the oxide semiconductors n-type titanium dioxide and n-type iron oxide in aqueous electrolyte have been improved by deposition of an oxygen evolution catalyst (platinum, rhodium) onto the semiconductor. In addition, the photocurrents of titanium dioxide can also be improved by optimization of the carrier density of the electrode upon passing sequences of anodic and cathodic currents. We demonstrated a negative shift in flat-band potential of titanium dioxide in the presence of dextrose in the electrolyte solution.

1896 **(CONF-7911178—1) Substrates for biotechnology and other products from lignocelluloses by steam pressure treatment combined with Gretraction.** Sinner, M.; Puls, J.; Dietrichs, H.H. (Bundesforschungsanstalt fuer Forst- und Holzwirtschaft, Hamburg (Germany, F.R.). Inst. fuer Holzchemie und Chemische Technologie des Holzes). 1979. 16p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82904716.

From Workshop on COST of production an feeding of single cell protein; Juelich, F.R. Germany (14 Nov 1979).

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Wood chips from birch, beech, and oak as well as chopped annual plants like cereal straw, bagasse, and elephant (napier) grass were treated with saturated steam at temperatures between 170 and 190°C for 5 to 80 minutes, fiberized in the hot stage by expansion or in a refiner, and the obtained fiber materials were extracted with hot water. In some cases the fiber materials were extracted additionally with 0.3 to 1.0% aqueous sodium hydroxyd.

1897 **(DOE/CS/20291—3) Development of the utilization of combustible gas produced in existing sanitary landfills: effects of corrosion at the Mountain View, CA Landfill Gas-Recovery Plant.** (Pacific Gas and Electric Co., San Francisco, CA (USA)). Oct 1982. Contract FG01-79CS20291. 64p. NTIS, PC A04/MF A01. Order Number DE83001576.

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Corrosion of equipment has occurred at the Mountain View, California Landfill Gas Recovery Plant. Corrosion is most severe on compressor valve seats and cages, tubes in the first and second stages of the interstage gas cooler, and first and second stage piping and liquid separators. Corrosion occurs because the raw landfill gas contains water, carbon dioxide, and oxygen. Some corrosion may also result from trace concentrations of organic acids present in the landfill gas. Corrosion of the third stage compressor, cooler, and piping does not occur because the gas is dehydrated immediately prior to the third stage. Controlling corrosion is necessary to maintain the mechanical integrity of the plant and to keep the cost of the gas competitive with natural gas. Attempts to reduce corrosion rates by injecting a chemical inhibitor have proved only partially successful. Recommendations for dealing with corrosion include earlier dehydration of the gas, selection of special alloys in critical locations, chemical inhibition, and regular plant inspections.

1898 **(DOE/ET/20279—227) Review of PV module performance at DOE/MIT Lincoln Laboratory test sites during the period 1977 to 1982.** Forman, S.E.; Themelis, M.P. (Massachusetts Inst. of Tech., Lexington (USA). Lincoln Lab.). 1982. Contract AC02-76ET20279. 10p. (CONF-820906—10). NTIS, PC A02/MF A01. Order Number DE83001136.

From 16. IEEE photovoltaics specialists conference; San Diego, CA, USA (28 Sep 1982).

During the years 1977 to 1982, over 11,000 photovoltaic (PV) modules have been placed at experimental PV power generating systems in a number of field test sites in the United States. Prominent among these are a 100-kW system at Natural Bridges National Monument in Utah, a 25-kWp system at Mead, Nebraska, and a 15-kW system at Bryan, Ohio. Through a program of periodic surveillance, measurements, and inspections at the aforementioned sites, electrically failed modules were located, removed and analyzed during this six-year period. The principal causes of failure were: (1) cells cracked due to weathering or internal module stresses, (2) failed solder joints, (3) interconnects not soldered to rear sides of cells at assembly, (4) cells or interconnects electrically shorted to metallic substrates, and (5) broken or split interconnects. Details and photographs of many of the different types of failures are presented and some of the analysis techniques used to locate the failures are described.

1899 **(DOE/ET/20279—228) Reduction of photovoltaic cell reverse breakdown by a peripheral bypass diode.** Cox, C.H. III; Silversmith, D.J.; Mountain, R.W. (Massachusetts Inst. of Tech., Lexington (USA). Lincoln Lab.). 1982. Contract AC02-76ET20279. 6p. (CONF-820906—6). NTIS, PC A02/MF A01. Order Number DE83001137.

From 16. IEEE photovoltaics specialists conference; San Diego, CA, USA (28 Sep 1982).

A photovoltaic cell in a series-connected string can be forced to operate in a power-dissipation mode when the cell's short-circuit current is reduced below the string current as a result of cracking or shadowing. New techniques for significantly reducing the power dissipated are reported based on locating protection for the cell around its periphery. One approach uses a standard diode, thereby requiring processing; the other approach uses a backward diode, which requires one additional doping step. Theoretical considerations and experimental results are presented. Initial devices yield a power-dissipation reduction of more than a factor of 10 with the backward diode and over 30 for the standard diode. It is found that the standard diode requires a slight increase in cell-interconnect complexity while the backward diodes uses conventional interconnections.

1900 **(DOE/ET/20279—229) Swept measurement of high-power I-V curves.** Cox, C.H. III; Warner, T.H. (Massachusetts Inst. of Tech., Lexington (USA). Lincoln Lab.). 1982. Contract AC02-76ET20279. 7p. (CONF-820906—7). NTIS, PC A02/MF A01. Order Number DE83001138.

From 16. IEEE photovoltaics specialists conference; San Diego, CA, USA (28 Sep 1982).

Performance evaluation of photovoltaic (PV) arrays under a variety of conditions provides important information for the design and maintenance of PV systems. One of the principal methods for assessing an arrays's performance is to plot its current, I, versus voltage, V, curve. Following a brief review of techniques for measuring the I-V curve, a new capacitive-based approach is presented. It uses a rapid sweep of the I-V curve which substantially reduces the average power transfer between array and load, and in turn, substantially reduces the size and weight of the curve tracer. Both theoretical and practical aspects of the approach are presented for a 10-kW unit. Performance is verified by comparison with I-V curves obtained by using a conventional load. The agreement is found to be excellent. Approximately an order of magnitude reduction in size, weight and power consumption over conventional units was realized with the experimental I-V curve tracer.

1901 **(DOE/ID/12274—T1-Vol.1) Technical/commercial feasibility study of the production of fuel-grade ethanol from corn: 100-million-gallon-per-year production facility in Myrtle Grove, Louisiana. Volume one. Executive summary.** (Chemapec Associates, New York (USA); Singmaster and Breyer, New York (USA)). 31 May 1982. Contract FG07-81ID12274. 153p. NTIS, PC A08/MF A01. Order Number DE83000777.

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This Executive Summary is Volume I of 7 volumes of a detailed feasibility study for a 100 million gallon/year Power Alcohol plant using corn as feedstock to be constructed in the vicinity of Belle Chaise, Louisiana, adjacent to an existing grain elevator complex. The proposed plant will ultimately have the capability to produce 100 million gallons/year of anhydrous alcohol from an estimated 40 million bushels of corn and will be designed so as to allow construction in modules of 25 million gallons each. Alcohol produced at this plant is intended essentially for use as a gasoline octane booster, a motor fuel in gasoline/alcohol blends and as a chemical feedstock. In addition, the plant will produce a number of by-products, each of which has existing commercial markets; namely, 236,400 tons of CO_2 237,600 tons of Protein Meal Mixture (40.2% Protein) or 124,000 tons of Gluten Meal (41% Protein), 20,000 tons of yeast, 68,400 tons of Corn Bran, 89,600 tons of Corn Germ Cake and 4,584,000 gallons of Corn Oil (food grade).

1902 **(DOE/ID/12274—T1-Vol.2) Technical/commercial feasibility study of the production of fuel-grade ethanol from corn: 100-million-gallon-per-year production facility in Myrtle Grove, Louisiana.** (Chemapec Associates, New York (USA); Singmaster and Breyer, New York (USA)). 31 May 1982. Contract FG07-81ID12274. 343p. NTIS, PC A15/MF A01. Order Number DE83000776.

The technical and economic feasibility of producing motor fuel alcohol from corn in a 100 million gallon per year plant to be constructed in Myrtle Grove, Louisiana is evaluated. The evaluation includes a detailed process design using proven technology, a capital cost estimate for the plant, a detailed analysis of the annual

operating cost, a market study, a socioeconomic, environmental, health and safety analysis, and a complete financial analysis. Several other considerations for production of ethanol were evaluated including: cogeneration and fuel to be used in firing the boilers; single by-products vs. multiple by-products; and use of boiler flue gas for by-product drying.

1903 **(DOE/ID/12274—T1-Vol.3) Technical/commercial feasibility study of the production of fuel-grade ethanol from corn: 100-million-gallon-per-year production facility in Myrtle Grove, Louisiana.** (Chemapec Associates, New York (USA); Singmaster and Breyer, New York (USA)). 31 May 1982. Contract FG07-81ID12274. 513p. NTIS (US Sales Only). Order Number DE83000775.

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The technical and engineering plan includes a review of current technology, process technology recommendation, single vs. multi by-product process, process description, resource requirements, utilities, use of boiler flue gas for by-product drying, plant layout alternatives, production schedule, procurement plan, and contingency, warranty, etc. As components of production the following are covered: corn supply, other raw materials supply, site selection, and the socio-economic environment of the area. The community infrastructure of Plaquemines Parish is described.

1904 **(DOE/ID/12274—T1-Vol.4) Technical/commercial feasibility study of the production of fuel-grade ethanol from corn: 100-million-gallon-per-year production facility in Myrtle Grove, Louisiana.** (Singmaster and Breyer, New York (USA)). 31 May 1982. Contract FG07-81ID12274. 163p. NTIS, PC A08/MF A01. Order Number DE83000774.

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This volume includes: the economic analysis; socioeconomic, environmental, health, and safety requirements; and the management and execution plan for Phase II construction.

1905 **(DOE/ID/12274—T1-Vol.5) Technical/commercial feasibility study of the production of fuel-grade ethanol from corn: 100-million-gallon-per-year production facility in Myrtle Grove, Louisiana. Volume five. Appendices.** (Chemapec Associates, New York (USA); Singmaster and Breyer, New York (USA)). 31 May 1982. Contract FG07-81ID12274. 556p. NTIS, PC A24/MF A01. Order Number DE83000773.

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Included in the appendices are: comparison of assumptions and results among studies, base case scenarios, production option analyses, selected sensitivity analysis reference output data, background on government incentives, industrial revenue bonds in Louisiana - conditions and procedures, draft permit application, and capital cost estimate.

1906 **(DOE/ID/12276—T1-Bk.1) Feasibility study for an ethanol plant in New Orleans, Louisiana. Book one. Executive summary. Volume 1 through 3.** (Louisiana Bio-Fuel, Inc., Metairie (USA)). Apr 1982. Contract FG07-81ID12276. 457p. NTIS, PC A20/MF A01. Order Number DE83000704.

The findings of a 9-month study of the feasibility of constructing and operating a 35 million gallon per year fermentation ethanol plant in the New Orleans area are presented. The unique features studied are the use of corn screenings, elevator by-products, and damaged grains as feedstock, and the use of municipal solid waste (MSW) as the process fuel. The plant will require investment outlays of $146 million, and the unit production cost for ethanol will be about $1.43 per gallon. The ethanol will be sold in the Louisiana and Texas markets. In Louisiana, gasohol benefits from an 8 cent per gallon state excise tax exemption as well as from the 4 cent per gallon federal excise tax exemption. The by-product, DDGS, will be sold to the overseas market. A large quantity of feedgrains and feedstuffs are exported from the port of New Orleans, and the plant's DDGS will have a price advantage over export feedgrains shipped from further inland.

1907 **(DOE/ID/12276—T1-Bk.2) Feasibility study for an ethanol plant in New Orleans, Louisiana. Book two. Volumes 4 through 7.** (Louisiana Bio-Fuel, Inc., Metairie (USA)). Apr 1982. Contract FG07-81ID12276. 433p. NTIS, PC A19/MF A01. Order Number DE83000705.

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A specific assessment on the selected priority site is reported. The proposed site's transportation and infrastructure requirements comparing the preferred off river locations to a hypothetical river location are analyzed. The transportation and grain transport alternatives are assessed for an off river location. An assessment of the availability and price of corn, corn screenings, elevator dust, and damaged grain in the New Orleans area are presented. Base conditions for the proposed ethanol plant, its environmental impact, the New Orleans economy, the ethanol plant and the local and state economy, the labor force and employment, and the plant in relation to national goal and impacts. Forty-three drawings for the proposed ethanol plant are included.

1908 **(DOE/ID/12276—T1-Bk.3) Feasibility study for an ethanol plant in New Orleans, Louisiana. Book three. Appendices.** (Louisiana Bio-Fuel, Inc., Metairie (USA)). Apr 1982. Contract FG07-81ID12276. 283p. NTIS, PC A13/MF A01. Order Number DE83000706.

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Process calculations are presented for each step in the plant process from mash preparation through distillation. For the areas of solid separation, evaporation and drying, results based on process calculations by vendors are presented. The results of these calculations are reflected in the Process Flow Diagrams. In the case of solids separation, evaporation and drying, the output flows and steam requirements reflect the best performance of vendor's equipment and process. In the case of mash preparation output stream composition, distillation, evaporation and drying process results can be warranted by the vendor. Also included are summary calculations of the plant wide steam balance, steam requirements, turbogenerator output condensate balance, cooling water requirements and chilled water requirements.

1909 **(DOE/ID/12277—T1-Vol.1) Feasibility study of a corn-to-ethanol plant in Sardis, Mississippi.** (Sun Belt Energy Corp., Sardis, MS (USA); Resource Planning Associates, Inc., Cambridge, MA (USA); Bechtel Petroleum, Inc., Louisville, KY (USA)). Jun 1982. Contract FG07-81ID12277. 138p. NTIS, PC A07/MF A01. Order Number DE83000805.

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A feasibility study for a corn-to-ethanol plant in Panola County, Mississippi was carried out. This area is well suited for the production of ethanol from corn, as it has a mild climate, a plentiful supply of wood fuel, and a well-developed agricultural infrastructure. The project was designed for 5 million gallons per year, using the ACR Process, a process proven in 6 plants now operating. It was determined to be technically feasible for this size. However, without a state financial incentive such as a gasoline excise tax or sales tax exemption, the plant is not economically feasible in Mississippi. Even though a 4 cents per gallon federal excise tax exemption will likely remain, the economics without any other incentive are not strong enough to obtain financing or equity funds. While the Mississippi legislature decided not to consider a financial incentive in their 1982 session, an attempt will be made to introduce a proposal for a suitable exemption during the 1983 legislative session. Until then, the project is on hold.

1910 **(DOE/ID/12277—T1-Vol.2) Feasibility study of a corn-to-ethanol plant in Sardis, Mississippi.** (Sun Belt Energy Corp., Sardis, MS (USA); Resource Planning Associates, Inc., Cambridge, MA (USA); Bechtel Petroleum, Inc., Louisville, KY (USA)). Jun 1982. Contract FG07-81ID12277. 117p. NTIS, PC A06/MF A01. Order Number DE83000806.

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A technical description of a chemical processing facility capable of producing 5 million gallons per year of denatured anhydrous ethanol (power alcohol) is presented. In addition, certain equipment options are evaluated on the basis of availability, reliabil-

ity, and budget constraints. Analysis of logistics and sensitivity of financial decision making criteria to market variables is not within the scope of this study. Consequently, concluding statements are limited to a discussion of technical feasibility and a statement of capital cost for turn-key construction.

1911 **(DOE/JPL—1012-76) Summary of flat-plate solar-array project documentation. Abstracts of published documents, 1975 to June 1982.** (Jet Propulsion Lab., Pasadena, CA (USA)). 15 Sep 1982. Contract AC04-78ET20536. 375p. NTIS, PC A16/MF A01. Order Number DE83001428.

Provided are abstracts of final reports and latest quarterly reports of Jet Propulsion Laboratory and contracted efforts that have constituted the JPL Flat-Plate Solar Array (FSA) Project, formerly the Low-Cost Solar Array (LSA) Project. Included are abstracts of project office reports, and of reports covering: project analysis and integration, silicon material, silicon sheet (large-area silicon sheet), encapsulation (environmental isolation), production process and equipment (process research), engineering (engineering sciences), and operations (module performance and failure analysis). (LEW)

1912 **(DOE/JPL/954929—82/9) Investigation of reliability attributes and accelerated stress factors of terrestrial solar cells. 1981 summary report.** Lathrop, J.W. (Clemson Univ., SC (USA). Dept. of Electrical and Computer Engineering). Jun 1982. Contract NAS-7-100-954929. 88p. NTIS, PC A05/MF A01. Order Number DE82019860.

Reported is a program to investigate the reliability attributes of terrestrial solar cells. The accelerated stress test results obtained on all cells since the inception of the program are summarized, as well as specific results obtained during the fourth year's effort. Tested cells were grouped according to the method used to form the conductive metallization layer: solder dipped, vacuum deposited, screen printed, and copper plated. Although metallization systems within each group were quite similar, they differed in numerous details according to the procedures employed by each manufacturer. Test results were summarized for all cells according to both electrical degradation and catastrophic mechanical changes. These results indicated a variability within each metallization category which was dependent on the manufacturer. Only one manufacturer was represented in the copper plated category and, although these showed no signs of detrimental copper diffusion during high temperature testing, their metallization was removed easily during high humidity pressure cooker testing. Preliminary testing of encapsulated cells showed no major differences between encapsulated and unencapsulated cells when subjected to accelerated testing. While further work must be performed, this seems to indicate the major role of encapsulation to be mechanical protection. An overview is given of the data collection and analysis procedures developed on the contract.

1913 **(DOE/JPL/955843—82/7) Large-area sheet task advanced dendritic-web-growth development. Quarterly report, April 1-June 30, 1982.** Duncan, C.S.; Seidensticker, R.G.; McHugh, J.P.; Hopkins, R.H.; Meier, D.; Schruben, J. (Westinghouse Research and Development Center, Pittsburgh, PA (USA)). 17 Sep 1982. Contract NAS-7-100-955843. 40p. NTIS, PC A03/MF A01. Order Number DE83002195.

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The computer code for calculating web temperature distribution has been expanded to provide a graphics output for $(\alpha T)'$ in addition to numerical and punch card output. The new code was used to examine various modifications of the J419 furnace configuration and, on the basis of the results, a new growth geometry was designed. Additionally, several mathematically defined temperature profiles were evaluated for the effects of the free boundary (growth front) on the thermal stress generation. Experimental growth runs were made with modified J419 configurations to complement the modeling work. A modified J435 furnace configuration was evaluated.

1914 **(DOE/RA/50316—T1-Attach.1) Methanol production from Eucalyptus wood chips. Working document I. The Florida Eucalyptus energy farm: silvicultural methods and considerations.** Fishkind, H.H. (Biomass Energy Systems, Inc., Lakeland FL (USA)). Apr 1982. Contract FG07-80RA50316. 166p. NTIS, PC A08/MF A01. Order Number DE83001606.

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The silvicultural matrix within which the nation's first large scale wood energy plantation will develop is described in detail. The relevant literature reviewed is identified and distilled. The plantation history, site preparation, planting, species selection, maintenance and management, harvesting, and the Eucalyptus biomass production estimates are presented.

1915 **(DOE/RA/50316—T1-Attach.3) Methanol production from eucalyptus wood chips. Attachment III. Florida's eucalyptus energy farm and methanol refinery: the background environment.** Fishkind, H.H. (Biomass Energy Systems, Inc., Lakeland, FL (USA)). Apr 1982. Contract FG07-80RA50316. 116p. NTIS, PC A06/MF A01. Order Number DE83001618.

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A wide array of general background information is presented on the Central Florida area in which the eucalyptus energy plantation and methanol refinery will be located. Five counties in Central Florida may be affected by the project, DeSoto, Hardee, Hillsborough, Manatee, and Polk. The human resources of the area are reviewed. Included are overviews of population demographic and economic trends. Land use patterns and the transportation are system described, and the region's archeological and recreational resources are evaluated. The region's air quality is emphasized. The overall climate is described along with noise and air shed properties. An analysis of the region's water resources is included. Ground water is discussed first followed by an analysis of surface water. Then the overall quality and water supply/demand balance for the area is evaluated. An overview of the region's biota is presented. Included here are discussions of the general ecosystems in Central Florida, and an analysis of areas with important biological significance. Finally, land resources are examined.

1916 **(DOE/RA/50316—T1-Attach.7) Methanol production from eucalyptus wood chips.** Fishkind, H.H. (Biomass Energy Systems, Inc., Lakeland, FL (USA)). Jun 1982. Contract FG07-80RA50316. 84p. NTIS, PC A05/MF A01. Order Number DE83001603.

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The technical feasibility of producing methanol from wood is demonstrated and sufficient cost data is provided to allow an assessment of the economic viability.

1917 **(DOE/RA/50316—T1-Attach.8) Methanol production from eucalyptus wood chips. Attachment VIII. The wood-fueled gasification system, Evergreen Energy Corporation's final engineering report.** Fishkind, H.H. (Biomass Energy Systems, Inc., Lakeland, FL (USA)). Jun 1982. Contract FG07-80RA50316. 39p. NTIS, PC A03/MF A01. Order Number DE83001602.

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Evergreen Energy Corporation provided projected cost and operating data on the Evergreen/Texaco entrained-bed wood gasification system currently under development as an alternative to the state-of-the-art fixed-bed wood gasification system proposed by Davy McKee. Overall capital costs for the total plant remain about the same at ~ $250 million. The Evergreen/Texaco system will provide significant capital cost savings in the gasifiers, gas cleanup, and waste water treatment sections, and eliminate the need for a large off-site wood-fired power boiler. These reductions are offset by higher investments in the feedstock preparation, drying, and feeding section plus the need for a larger air separation plant and compressor to supply oxygen at high pressure to the gasifier.

1918 **(DOE/RA/50316—T1-Vol.1) Methanol production from Eucalyptus wood chips. Final report.** Fishkind, H.H. (Biomass Energy Systems, Inc., Lakeland, FL (USA)). Jun 1982. Contract FG07-80RA50316. 144p. NTIS, PC A07/MF A01. Order Number DE83001600.

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This feasibility study includes all phases of methanol production from seedling to delivery of finished methanol. The study examines: production of 55 million, high quality, Eucalyptus seedlings through tissue culture; establishment of a Eucalyptus energy plantation on approximately 70,000 acres; engineering for a 100 million gallon-per-day methanol production facility; potential environmental impacts of the whole project; safety and health aspects of producing and using methanol; and development of site specific cost estimates.

1919 **(DOE/RA/50330—1) New Energy Corporation of Indiana final study report on construction of a fuel-grade ethanol plant. Final report.** (New Energy Corp. of Indiana, Washington, DC (USA)). 30 Sep 1981. Contract FG07-80RA50330. 344p. NTIS, PC A15/MF A01. Order Number DE83000703.

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The basis of design; a description of the facility with a site drawing and equipment general arrangement; a section on energy consumption and the facility energy balance, process description, process flow diagrams, facility description, equipment list with outline specifications; a section describing the on-site steam generating facility, waste water treatment facility; and a section covering the operating requirements of the facility such as chemical and manning requirements, and the capital cost for the complete facility are included.

1920 **(DOE/RA/50330—1-Attach.5) New Energy Corporation of Indiana final study report on construction of a fuel-grade ethanol plant. Attachment V. Equipment list, line index.** (New Energy Corp. of Indiana, Washington, DC (USA)). 24 Feb 1981. Contract FG07-80RA50330. 314p. NTIS, PC A14/MF A01. Order Number DE83000693.

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1921 **(DOE/RA/50330—1-Vol.1-Attach.4) New Energy Corporation of Indiana final study report on construction of a fuel-grade ethanol plant. Attachment IV (Volume I). Equipment specifications.** (New Energy Corp. of Indiana, Washington, DC (USA)). 12 Dec 1980. Contract FG07-80RA50330. 333p. NTIS, PC A15/MF A01. Order Number DE83000697.

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Specifications are presented for: steam generation facility and supporting systems; architectural design consideration for corn receiving; storage milling; distillers dry grain drying and cooling system; conveyor; general equipment; dust collector; feeders; field erected tanks; railroad track scale; fermentor and beer well tanks; and floating roof tanks. Contract documents for coal burning power plant are included.

1922 **(DOE/RA/50338—1-Vol.1-Attach.A) Report on the engineering and economics of an ethanol/gasohol jointventure project with Caldwell Sugars Co-op, Inc. at Thibodaux, Louisiana. Attachment A, Volume 1. Definition of facilities and scope of work for an ethanol facility to be located at Thibodaux, Louisiana.** (Process Plants, Inc., Houston, TX (USA); Tate and Lyle Technical Services Ltd., Coral Gables, FL (USA)). Apr 1982. Contract FG07-81RA50338. 304p. NTIS, PC A14/MF A01. Order Number DE83001166.

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A Lump Sum Proposal for engineering, procurement, and construction service for the ethanol plant is presented. The scope of work and process description are covered. The process description includes the process flow diagrams, equipment list, and piping and instrument diagrams.

1923 **(DOE/RA/50338—1-Vol.2-Attach.B) Report on the engineering and economics of an ethanol/gasohol jointventure project with Caldwell Sugars Co-op, Inc. at Thibodaux, Louisiana. Attachment B, Volume II. Definitive estimate. Sections 2-9 (excluding terminal). Accounts K through R.** (Badger America, Inc., Tampa, FL; Tate and Lyle Technical Services Ltd., Coral Gables, FL (USA)). Apr 1982. Contract FG07-81RA50338. 582p. NTIS, PC A25/MF A01. Order Number DE83001196.

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Cost estimates are presented for the following: instruments, fire proofing/fire protection, buildings, foundations and piling, sewers, site preparation, insulation, and painting.

1924 **(EUR—7163-FR) Industrial technology of economical and reliable encapsulation for large solar panels. Final report.** Anguet, J.; Salles, Y. (La Radiotechnique Compelec (RTC), 14 - Caen (France)). 1981. 20p. (In French). European Community Information Service, 2100 M St., N.W., Washington, DC 20037.

A study is made of the feasibility of adapting the technique employed for laminating glass in making automobile windshields to the encapsulation of solar cells. The study indicates the applicability of that technique with certain modifications.

1925 **(EUR—7795-EN) Construction of a photovoltaic cell based on the photoelectrochemistry of organic dyes at transparent semi-conducting electrodes. Final report.** Nasielski, J.; Kirsch-De Mesmaeker, A. (Brussels Univ. (Belgium). Faculte des Sciences). 1982. 98p. European Community Information Service, 2100 M Street NW, Suite 707, Washington, DC 20037.

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It is shown that the study of the photoelectrochemical mechanisms of different dye-reductant systems at transparent semi-conducting bubbling gas electrodes, coupled with a detailed analysis of the photovoltammetric curves, allows: a deeper insight into the operation principles of the corresponding dye photogalvanic cells; prediction of the parameters important for optimizing the cell operation; and working out of strategies for improving the cell output. In order to compare the behaviors of an adsorbed type dye (rhodamine-hydroquinone) with a solution type dye in a photogalvanic cell, the thionine-Fe^{3+} system was examined, including a detailed kinetic analysis of the photocurrents at the bubbling gas electrode as a function of several parameters. Photoelectrochemical mechanisms related to the sensitization and supersensitization in this system have thus been determined. Photoelectrochemical methods were applied to analyze other dye-reductant systems. The photoelectrochemisty of three triphenyl-methanes, methyl violet, crystal violet, and malachite green were examined at the bubbling gas electrode. These dyes produce photocurrents originating from the adsorbed molecules and behave very much like rhodamine. The photoelectrochemical behavior of the erythrosine-hydroquinone couple is also examined. For constructing photogalvanic cells, the CdS-on-SnO_2-cysteine system is found promising. (LEW)

1926 **(LBL—14223) Enzymatic hydrolysis of corn stover process development and evaluation.** Perez, J.; Wilke, C.R.; Blanch, H.W. (Lawrence Berkeley Lab., CA (USA)). Dec 1981. Contract AC03-76SF00098. 245p. NTIS, PC A11/MF A01. Order Number DE83001379.

Thesis.

The hydrolysis of acid treated corn stover with cellulase from T. reesei Rut-C-30 was evaluated. Experiments were conducted with substrate concentrations of 5 to 25% by weight, enzyme activities of 0.5 to 7 IU/ml and residence times of 24 to 48 hours. Maximum conversion was 55% for specific cellulase activity of 25 to 30 IU/g. Optimum cellobiase activity for minimum cellobiose production was found to be approximately 1.8 cellobiase units to 1 FPA unit. Hydrolysis experiments with steam exploded corn stover led to a maximum conversion of 80%, significantly higher than the results obtained for acid treated substrate. Steam exploded corn stover was demonstrated as a suitable carbon source for growth of T. reesei in submerged cultures.

1927 **(NP—2904731) Photovoltaic effect and conduction mechanism in barium titanate ceramics.** Kaeppler, W. (Technische Hochschule Aachen (Germany, F.R.). Fakultaet fuer Elektrotechnik). 8 Feb 1980. 81p. (In German). NTIS (US Sales Only), PC A05/MF A01. Order Number DE82904731.

Thesis.

First models are discussed critically, which interpret the photovoltaic effect in single crystals as a volume effect. The volume effect is attributed to optically induced polarisation changes. As is shown the volume photovoltaic effect can be produced by imperfections as well as interband transitions. The effect is studied for barium titanate ceramics of different composition. To interprete the experimental results of polycrystalline samples, the single crystal model is presumed to be valid for an individual grain, provided this grain can be considered to be homogenious with respect to chemical composition and its electrical properties. Additional photovoltages at the grain boundaries are separated from the volume effect by doing measurements with ceramics of different grain size. As can be shown by these experiments, the volume effect dominates in pure barium titanate single crystals and ceramics, however in all mixed ceramics studied in this work the grain boundary effects are move pronounced.

1928 (NRAES—13, pp 1-24) **Earthen-supported plug flow reactor for dairy applications.** Jewell, W.J.; Kabrick, R.M.; Dell'Orto, S.; Fanfoni, K.J.; Cummings, R.J. (Cornell Univ., Ithaca, NY). 1981. Northeast Regional Agricultural Engineering Service, Ithaca, NY 14853.

From Methane technology for agriculture conference; Ithaca, NY, USA (17 Mar 1981).

A cost-effective and practical anaerobic fermentation system for small dairies, i.e., 65-cow operations was studied. After defining the design requirements in comprehensive bench scale operations for a period of three years, a pilot reactor (with a three-cow capacity) was constructed and operated continuously for two years. The positive data supplied by these extensive tests provided the technical basis to design a full scale plug flow system. Such a unit was built at full scale (34 m^3) for 65 cows. A control reactor of the same size using completely mixed technology was also built and has been operated in parallel under the same condition as the plug flow unit. All operating experiences indicate that the plug flow system is a more effective design than the more costly completely mixed conventional alternative. At longer retention times more than 90% of the biodegradable organics were converted to biogas in the plug flow design, whereas less than 80% were converted under identical conditions in the full scale control system.

1929 (NRAES—13, pp 25-31) **Rigid wall mixed reactors for dairies.** Persson, S.P.E.; Bartlett, H.D. (Pennsylvania State Univ., University Park). 1981. Northeast Regional Agricultural Engineering Service, Ithaca, NY 14853.

From Methane technology for agriculture conference; Ithaca, NY, USA (17 Mar 1981).

A biogas digester design is discussed as follows: size, construction materials, slurry system, heating system, insulation, agitation, and operation.

1930 (NRAES—13, pp 175-177) **Complete systems: challenges and responsibilities of the supplier.** Weeks, S.A. (Agway Inc., Tully, NY). 1981. Northeast Regional Agricultural Engineering Service, Ithaca, NY 14853.

From Methane technology for agriculture conference; Ithaca, NY, USA (17 Mar 1981).

Research activities include the following: the daily spreading of manure vs a semisolid management system, a semisolid storage-anaerobic digester system, digester design, and biogas utilization.

1931 **(NZERDC-P—61) Farm-scale ethanol plant for New Zealand.** (New Zealand Energy Research and Development Committee, Auckland). May 1982. 67p. NTIS (US Sales Only), PC A04/MF A01. Order Number DE83900329.

This report draws together the results of Phase 1 of an ongoing investigation into small-scale ethanol plants suited for application at farm level in New Zealand. The potential demand for fuel ethanol varies widely between farm types, and depends on the extent of substitution envisaged in both petrol and diesel engines. An analysis of available data suggests that an annual maximum production limit of 50,000 l for an individual farm is a realistic design criterion. Total installed capital costs are estimated at between $33,000 and $45,000 for the basic plant, depending on feedstock and capacity. These costs could, however, be significantly reduced by using existing farm facilities or farm labor for construction or erection. Unit production costs vary from $0.60 to $4.00 per litre of fuel ethanol, with plants using beet or waste potatoes as a feedstock and producing more than 20,000 litres having the lowest cost. In most situations, however, the unit cost of the ethanol produced exceeds the price of the petroleum fuel displaced. Based on economic considerations alone fuel ethanol does not, therefore, represent an alternative fuel option which will have widespread application in New Zealand unless relative prices change, or supply restraints are reintroduced.

1932 **(ORNL/Sub—81-9051/1) Genetic selection of American sycamore for biomass production in the mid-south. Final report, March 9, 1979-May 31, 1982.** Land, S.B. Jr. (Mississippi State Univ., Mississippi State (USA). Mississippi Agricultural and Forestry Experiment Station). Sep 1982. Contract W-7405-ENG-26. 119p. NTIS, PC A06/MF A01. Order Number DE83000401.

Five-year-old sycamore progeny tests at five sites in Mississippi were used to develop biomass prediction equations and examine genetic, site, and propagule effects on above-stump biomass. Accuracy and precision of subsampling procedures utilizing green weight ratios were high for stem wood and bark, slightly less for limb components, and poorest for the leaf component. The best predictor variables for stem biomass equations were DBH, $(DBH)^2$, and $(DBH)^2$ times height. Crown width, crown surface area, and $(DBH)^2$ times the crown-length/tree-height ratio were more appropriate predictors for limb or leaf biomass. Prediction equations differed among sites and, for some traits, among seed sources. Specific gravity and moisture content varied within the tree, among sites, and among families within seed sources, but not among sources. Resistance to a lethal complex of canker diseases was strongly controlled by geographic seed origin and by mother-tree family within seed source. Trees from southern sources near the Mississippi River were more resistant than trees from northern sources of the Mid-South region. Survival, biomass per tree, and biomass per hectare were lowest for trees established from seedling-top cuttings, higher for top-pruned seedlings, and highest for whole seedlings. Site differences were very large for biomass production, with the best site having nearly as much stem-plus-limb dry weight per hectare at age five (22.3 metric tonnes per hectare) as three other sites combined. Geographic seed sources from south of each planting site produced more biomass per hectare than sources from north of the site. Family differences within sources were significant, as were site-by-family interactions.

1933 **(PB—82-197898) Sugar beet production as influenced by water stress.** Flack, T.E. (Colorado State Univ., Fort Collins (USA)). 1981. 80p. NTIS, PC A05/MF A01.

Irrigation water supplies are becoming expensive and scarce in the western United States. As a water management tool, production functions indicating relationships between crop yields and evapotranspiration have been utilized. Models have been developed using this information. Transferability of these models is dependent upon understanding the moisture extraction characteristics for a given crop under a given set of climatic and soil conditions. Therefore, a wide range of water stress conditions must be produced. The objective of our research was to generate production function data for sugar beets (Beta vulgaris) as influenced by drought stress under irrigation.

1934 **(PB—82-214339) Proceedings of a workshop on environmental impacts of marine biomass. Final report Feb-Oct 81.** Ritschard, R.; Berg, V.; Killeen, S. (Lawrence Berkeley Lab., CA (USA)). Sep 1981. 60p. NTIS, PC A04/MF A01.

A workshop to discuss environmental issues related to marine biomass production was held in Napa, California. The par-

ticipants included 40 experts from a wide range of marine disciplines including biological, chemical and physical oceanography. The workshop identified and evaluated potential environmental issues of an open ocean biomass system and made research recommendations to GRI for needed environmental studies. Several critical issues were identified that need to be addressed by the GRI environmental research program. A detailed assessment is needed of the particulate organic matter (POM) flux from the kelp to the deep water column and sediments in order to determine the impact of kelp farming on ocean oxygen budgets, considering kelp fragments and residues from the anaerobic digestion process. Also, it is necessary to understand the dynamics of upwelled water especially related to nutrient availability and uptake. In addition, from an engineering and operations aspect, a critical test farm experiment is required of the farm structure, including its associated pumps (wave-driven) and attachment lines. Finally, the issue of digester residue disposal must be evaluated to suggest environmentally acceptable disposal or utilization practices.

1935 **(PNL-SA—9954-Rev.1) Steam gasification of wood in the presence of catalysts.** Mudge, L.K.; Mitchell, D.H.; Baker, E.G.; Robertus, R.J.; Brown, M.D. (Pacific Northwest Lab., Richland, WA (USA)). 1982. Contract AC06-76RL01830. 24p. (CONF-820685—3-Rev.1). NTIS, PC A02/MF A01. Order Number DE83002071.

From 14. biomass thermochemical conversion contractor's meeting; Arlington, VA, USA (23 Jun 1982).

Catalytic steam gasification of wood, including sawdust, chipped forest slash, and mill shavings, is being investigated. Results of laboratory, process development unit (PDU), and feasibility studies illustrate attractive processes for conversion of wood to methanol and a substitute natural gas (SNG). Recent laboratory studies developed a long-lived alloy catalyst for generation of a methanol synthesis gas by steam gasification of wood. Modification of the PDU for operation at 10 atm (150 psia) is complete and initial tests have been completed. The modified PDU will be operated at elevated pressures to confirm yields and design parameters used in process feasibility studies. A computer program for evaluating the effect of yield changes on process economics was completed. The base case was the study on economics of methanol-from-wood using catalytic gasification. This study showed that methanol-from-wood by catalytic gasification was competitive with process for methanol production from natural gas.

1936 **(PNL-SA—10350) Formation of aromatic compounds from condensation reactions of cellulose degradation products.** Nelson, D.A.; Russell, J.A.; Molten, P.M. (Pacific Northwest Lab., Richland, WA (USA)). 1982. Contract AC06-76RL01830. 6p. (CONF-821051—1). NTIS, PC A02/MF A01. Order Number DE83002033.

From International conference on fundamentals of thermochemical biomass conversion; East Park, CO, USA (18 Oct 1982).

Biomass is chemically a complex mixture of cellulose, hemicellulose, lignin, and many other substances, depending on the source of the material. The contributions of each major component are to be studied separately, starting with the alkaline liquefaction of cellulose. Various liquefaction products are described.

1937 **(SAND—80-7075) Silicon concentrator cell-assembly development.** (Solarex Corp., Rockville, MD (USA)). Aug 1982. Contract AC04-76DP00789. 71p. NTIS, PC A04/MF A01. Order Number DE83001683.

The purpose of this program is to develop an improved cell assembly design for photovoltaic concentrator receivers. Efforts were concentrated on a study of adhesive/separator systems that might be applied between cell and substrate, because this area holds the key to improved heat transfer, electrical isolation and adhesion. It is also the area in which simpler construction methods offer the greatest benefits for economy and reliability in the manufacturing process. Of the ten most promising designs subjected to rigorous environmental testing, eight designs featuring acrylic and silicon adhesives and fiberglass and polyester separators performed very well.

1938 **(SAND—82-0514C) Test data analysis and results for concentrating photovoltaic modules.** Edenburn, M.W.; Gerwin, H.J.; Chiang, C.J. (Sandia National Labs., Albuquerque, NM (USA)). 1982. Contract AC04-76DP00789. 6p. (CONF-820906—20). D. Order Number DE83000049.

From 16. IEEE photovoltaics specialists conference; San Diego, CA, USA (28 Sep 1982).

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An expression for efficiency is presented that is a linear function of cell temperature and illumination. This expression is used to correlate test data for concentrating photovoltaic modules. The linear form of the equation is justified by showing that it derives from a cell model that considers the cell to be a parallel current source and diode in series with a resistance. The linear expression has been used to correlate test results for a variety of concentrating modules. Results for those modules that are currently the most promising and interesting to the photovoltaic community are presented.

1939 **(SAND—82-0539C) Low-cost modular array-field designs for flat-panel and concentrator photovoltaic systems.** Post, H.N.; Carmichael, D.C.; Alexander, G.; Castle, J.A. (Sandia National Labs., Albuquerque, NM (USA); Battelle Columbus Labs., OH (USA); Hughes Aircraft Co., Los Angeles, CA (USA)). 1982. Contract AC04-76DP00789. 6p. (CONF-820906—13). NTIS, PC A02/MF A01. Order Number DE83000079.

From 16. IEEE photovoltaics specialists conference; San Diego, CA, USA (28 Sep 1982).

Described are the design and development of low-cost, modular array fields for flat-panel and concentrator photovoltaic (PV) systems. The objective of the work was to reduce substantially the cost of the array-field Balance-of-System (BOS) subsystems and site-specific design costs as compared to previous PV installations. These subsystems include site preparation, foundations, support structures, electrical wiring, grounding, lightning protection, electromagnetic interference considerations, and controls. To reduce these BOS and design costs, standardized modular (building-block) designs for flat-panel and concentrator array fields have been developed that are fully integrated and optimized for lowest life-cycle costs. Using drawings and specifications now available, these building-block designs can be used in multiples to install various size array fields. The developed designs are immediately applicable (1982) and reduce the array-field BOS costs to a fraction of previous costs. Prototype array fields are currently being installed using each of the two alternative building-block designs developed for flat-panel PV array fields.

1940 **(SAND—82-0732) Results of the PRDA 35 qualification tests of the BDM concentrating photovoltaic module.** Harrison, T.D. (Sandia National Labs., Albuquerque, NM (USA)). Aug 1982. Contract AC04-76DP00789. 29p. NTIS, PC A03/MF A01. Order Number DE83002136.

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During the period March 30 to October 30, 1981 two concentrators and eight module sections from an actively cooled, concentrating photovoltaic array were tested by Sandia National Laboratories to the PRDA 35 specifications. Two different concentrators were used during the test program. Physical, electrical, and thermal characteristics as well as electrical performance data are presented. The effects of temperature cycling and freeze-thaw cycling exposure tests are given. Results presented revealed problems that are being corrected so that the module used to build the array will meet the PRDA 35 qualification goals.

1941 **(SAND—82-1031C) Hydrogen passivation of polycrystalline silicon photovoltaic cells.** Seager, C.H.; Sharp, D.J.; Panitz, J.K.G.; Hanoka, J.I. (Sandia National Labs., Albuquerque, NM (USA); Mobil Tyco Solar Energy Corp., Waltham, MA (USA)). 1982. Contract AC04-76DP00789. 26p. (CONF-820961—1). NTIS, PC A03/MF A01. Order Number DE82022168.

From Colloquium on polycrystalline semiconductors; Perpignan, France (2 Sep 1982).

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The effect of atomic hydrogen on silicon grain boundaries is reviewed along with recent scanned spot methods for measuring the minority carrier recombination velocity, s, at grain boundaries. Measurements on a large number of grain boundaries in Honeywell silicon-on-ceramic are presented which show that s typically changes from ~ 2 x 10^5cm/sec to 3 x 10^3cm/sec, or less, after a few minutes exposure to an intense atomic hydrogen source. Electron-Beam-Induced-Current data on numerous grain boundaries are discussed; these show that the differences in barrier height reduction from boundary to boundary in response to hydrogen at the sample surface are due to differences in boundary properties and not to fluctuations in the treatment conditions. The results of applying the Kaufman ion source passivation method to Edge Fed Growth ribbon solar cells indicate that substantial efficiency increases can be achieved in these devices with only a few minutes exposure to the hydrogen ion beam.

1942 **(SAND—82-1701) Fundamental studies of grain boundary passivation in polycrystalline silicon with application to improved photovoltaic devices. A research report covering work completed from February 1981 to January 1982.** Seager, C.H.; Ginley, D.S. (Sandia National Labs., Albuquerque, NM (USA)). Sep 1982. Contract AC04-76DP00789. 59p. NTIS, PC A04/MF A01. Order Number DE83000803.

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Grain boundary barrier heights and other properties were measured on a variety of Wacker poly-Si to test the contention of Redfield that as received samples had no potential barriers and that temperature anneals activate the impurities in the boundaries. Our results show that these generalizations are not true and that a variety of barrier behaviors are found. Several of our new analytical techniques for studying grain boundaries and their passivation have been upgraded, including a new cell for Fourier Transform Infrared (FTIR) studies, electrochemical techniques, and a laser scanning apparatus for imaging grain boundaries. Grain boundaries in a variety of samples have been successfully passivated by the use of both the Kaufman ion source and a dc discharge apparatus. 20% improvements in cell efficiencies have been observed in large grained poly-Si cells, and the time of treatment has been drastically reduced.

1943 **(SAND—82-1744) Microprocessor-controlled photovoltaic-array loading unit.** Russell, D.F. (Sandia National Labs., Albuquerque, NM (USA)). Aug 1982. Contract AC04-76DP00789. 60p. NTIS, PC A04/MF A01. Order Number DE83000797.

Described is a microprocessor-controlled test system in operation at the Photovoltaics Advanced Systems Test Facility located at Sandia National Laboratories. The test system is designed to measure the total energy output of photovoltaic arrays. The theory, installation, operation, and calibration of the test system are described.

1944 **(SAND—82-2162C) Design and economics of a photovoltaic concentrator array for off-grid applications.** Maish, A.B.; Rios, M. Jr. (Sandia National Labs., Albuquerque, NM (USA)). 1982. Contract AC04-76DP00789. 6p. (CONF-820906—19). NTIS, PC A02/MF A01. Order Number DE83000318.

From 16. IEEE photovoltaics specialists conference; San Diego, CA, USA (28 Sep 1982).

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A second generation stand-alone 680 W/sub p/ photovoltaic (PV) concentrating array for low-power, non-grid connected applications has been designed and costed at Sandia National Laboratories. The array consists of six passively-cooled point-focus Fresnel lens concentrating modules on a two-axis polar mount tracking structure. The new array design incorporates several major improvements to the first generation design which was built and tested at Sandia National Laboratories. These include 50% more array area and a control system which allows unattended, fully-automatic operation. This paper discusses the array design and expected performance. Using a range of estimated production costs for small production volumes, the life-cycle energy costs have been calculated and compared to the equivalent energy costs of a 3 kW diesel electric generator set and an equivalent flat panel PV system.

1945 **(SAND—82-2218C) Some advanced testing techniques for concentrator photovoltaic cells and lenses.** Wiczer, J.J.; Chaffin, R.J.; Hibray, R.E. (Sandia National Labs., Albuquerque, NM (USA)). 1982. Contract AC04-76DP00789. 19p. (CONF-820906—18). NTIS, PC A02/MF A01. Order Number DE83000321.

From 16. IEEE photovoltaics specialists conference; San Diego, CA, USA (28 Sep 1982).

Described are two separate test techniques for evaluating concentrator photovoltaic components. For convenient characterization of concentrator solar cells, a method has been developed for measuring the entire illuminated I-V curve of a photovoltaic cell with a single flash of intense simulated sunlight. This method reduces the heat input to the cell and the time required to test a cell, thus making possible quick, indoor measurements of photovoltaic conversion efficiency at concentrated illumination levels without the use of elaborate cell mounting fixtures or heat sink attachments. The other test method provides a technique to analyze the spatially dependent, spectral distribution of intense sunlight collected and focused by lenses designed for use in photovoltaic concentrator systems. This information is important in the design of multijunction photovoltaic receivers, secondary concentrators, and in optimizing the performance of conventional silicon cell concentrator systems.

1946 **(SERI/PR—8143-1-T10) Development of copper sulfide/cadmium sulfide thin-film solar cells. Eleventh technical progress report, January 1-March 31, 1982.** Szedon, J.R. (Westinghouse Research and Development Center, Pittsburgh, PA (USA)). 26 Aug 1982. Contract AC02-77CH00178. 24p. NTIS, PC A02/MF A01. Order Number DE83001421.

The objective of the program reported is to characterize and improve the stability of Cu_xS/CdS thin-film solar cells having conversion efficiency values of 9% or greater. Specifically, the current phase is concerned with identifying mechanisms which degrade cell performance, improving the stability of cells by encapsulation, and improving the intrinsic stability of the cells by modifying the cell structure during or after fabrication. No rapid component of short-circuit current loss due to aging in moist oxygen was found. For the first 54 hours of aging results can be fitted using a single time constant with a value of about 30 hours. Information was obtained on the rate of change of the effective density of donors in the CdS space-charge region, which modulates the tunnelling opposing current that controls open-circuit voltage behavior in these cells. An increase in the density of donors of about 70% during 400 hours of aging was observed. The increase could be fit to an exponential function with a time constant of about 35 hours. (LEW)

1947 **(SERI/PR—9330-1-T7) Preparation and properties of evaporated CdTe films compared with single-crystal CdTe. Progress report No. 7, May 1-July 31, 1982.** Bube, R.H. (Stanford Univ., CA (USA). Dept. of Materials Science and Engineering). 1982. Contract AC02-77CH00178. 41p. NTIS, PC A03/MF A01. Order Number DE82022183.

The goal of our research is to develop efficient thin-film solar cells involving CdTe as the absorbing material using the method of hot-wall vacuum evaporation (HWVE) for CdTe film deposition. We have developed the HWVE method and applied it to the deposition of n-type CdTe films doped with In, and have explored some of the problems of low resistance back contacts to these films and the fabrication of homojunctions using these films on single crystal p-type CdTe substrates. In order to compare the electrical properties of n-type CdTe films grown on an amorphous substrate with films grown on a single crystal substrate, films have been deposited simultaneously on BaF_2 and 7059 glass. Corollary investigations have explored the dependence of film properties on the substrate temperature during deposition, and the dependence of electron density in the films with the indium source temperature during deposition. A quantitative computer model for grain boundary transport in polycrystalline materials has been formulated to aid in the analysis of these materials. A variety of back contact materials and configurations have been tested for low resistance contacts to the n-type CdTe:In layers. Two CdTe homojunction configurations were analyzed in which n-CdTe films were deposited by HWVE on p-type single crystal substrates. In the first an n-type film of 1.5 μm thickness was deposited, which is much too thick for

high current collection, and in the second an n-type film of about 0.3 μm thickness was deposited. Subsequently this second type of cell was overlayered with ZnO and ITO layers to provide transparent conducting coatings over a relatively large area. Research on the properties of grain boundaries in n-type and p-type CdTe bicrystals focussed on the effects of various passivation techniques.

1948 **(SERI/TP—211-1609) Photovoltaic advanced research and development program in the United States.** Stone, J.L.; Ritchie, D.W.; Surek, T.; Witt, C.E. (Solar Energy Research Inst., Golden, CO (USA)). Sep 1982. Contract AC02-77CH00178. 12p. (CONF-820555—5). NTIS, MF A01. Order Number DE83000307.

From 4. phootovoltaic solar energy conference; Stresa, Italy (10 May 1982).

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The major thrust of the Advanced Research and Development Subprogram is to achieve technical feasibility for various advanced material technologies through long term, high risk, and potentially high payoff research and development. Two approaches are being pursued in order to achieve the cost and efficiency goals. One is to research various polycrystalline and amorphous thin film semiconducting materials on low cost substrates. The other approach is to use solar concentrators in the form of either high efficiency multibandgap cells having 20-40% efficiency potential or luminescent collectors. Polycrystalline thin films under development include polycrystalline silicon, II-VI compounds such as CdS and CdTe, III-V compounds such as GaAs. Also included are photoelectrochemical cells with polycrystalline photoelectrodes. The technical approaches, funding, and future activities are described for each area of research. (LEW)

1949 **(SERI/TP—211-1716) Progress in polycrystalline thin-film photovoltaic-device research.** Hermann, A.M.; Fabick, L.; Zweibel, K.; Hardy, R. (Solar Energy Research Inst., Golden, CO (USA)). Sep 1982. Contract AC02-77CH00178. 8p. (CONF-820906—15). NTIS, PC A02/MF A01. Order Number DE83001232.

From 16. IEEE photovoltaics specialists conference; San Diego, CA, USA (28 Sep 1982).

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Recent results from the United States Department of Energy (DOE) Thin-Film Photovoltaic Device Program are presented. The program encompasses materials and device research on highly absorbing compound semiconductors including $CuInSe_2$, CdTe, Cu/sub 2-x/Se, Zn_3P_2, $ZnSiAs_2$, and Cu_2S. Excitement in the program has been generated by recent progress in the $(Cd,Zn)S/CuInSe_2$ device area where an efficiency of 10.6% on a 5 μm thick device has been reported. Other highlights include deposition of a hybrid CdS/Cu_2S device (evaporated CdS, sputtered Cu_2S) with a 7.1% AM1 efficiency, and of a 3.94% AM1 efficiency all-sputtered CdS/Cu_2S cell. AM1 efficiencies exceeding 5% are reported for CdTe Schottky barrier and heterojunction devices, and for a CdS/Cu/sub 2-x/Se heterojunction. AM1 efficiencies exceeding 4% are reported for Mg/Zn_3P_2 Schottky barrier cells. Future research emphasis is outlined.

1950 **(SERI/TP—211-1731) Application of electrogenerated conducting polymer in electrochemical photovoltaic cells.** Noufi, R. (Solar Energy Research Inst., Golden, CO (USA)). Sep 1982. Contract AC02-77CH00178. 8p. (CONF-820906—24). NTIS (US Sales Only). Order Number DE83002092.

From 16. IEEE photovoltaics specialists conference; San Diego, CA, USA (28 Sep 1982).

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Results are presented which show that electrochemically generated conducting polypyrrole films protect n-type semiconductor photoelectrodes from degradation while permitting electron exchange between the semiconductor and the electrolyte. The performance characteristics and stability of such film-covered photoelectrodes are discussed.

1951 **(SERI/TP—211-1747) Research on polycrystalline-silicon solar cells: goals and accomplishments.** Milstein, J.B.; Hardy, R.W.; Tsuo, Y.S. (Solar Energy Research Inst., Golden, CO (USA)). Sep 1982. Contract AC02-77CH00178. 6p. (CONF-820906—22). NTIS, PC A02/MF A01. Order Number DE83002093.

From 16. IEEE photovoltaics specialists conference; San Diego, CA, USA (28 Sep 1982).

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This paper reviews the results obtained in the polycrystalline silicon solar cell task area at the Solar Energy Research Institute (SERI) since the last IEEE Photovoltaic Specialists Conference, and presents a description of the goals which are expected to be achieved in the next year and beyond. Some of the future program elements are presented in general terms, in view of Requests for Proposals that are presently in process.

1952 **(SERI/TP—211-1757) Grain-boundary structure and properties in polycrystalline silicon.** Tsuo, Y.S.; Hardy, R.W.; Milstein, J.B. (Solar Energy Research Inst., Golden, CO (USA)). Sep 1982. Contract AC02-77CH00178. 8p. (CONF-820906—28). NTIS (US Sales Only). Order Number DE83001727.

From 16. IEEE photovoltaics specialists conference; San Diego, CA, USA (28 Sep 1982).

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Recent advances in studying the grain boundary properties of polycrystalline silicon solar cell materials are reviewed. Of particular importance are the recent improvements in hydrogen grain boundary passivation techniques that have not only shortened the required passivation treatment time to only a few minutes but also demonstrated the ability to significantly increase polycrystalline silicon solar cell efficiencies for both large-grained and small-grained materials.

1953 **(SERI/TP—212-1718) Series resistance associated with thick-film contacts to solar cells.** Hogan, S.J.; Firor, K.; Barrett, J.M.; Coyle, R.T. (Solar Energy Research Inst., Golden, CO (USA)). Sep 1982. Contract AC02-77CH00178. 6p. (CONF-820906—27). NTIS (US Sales Only). Order Number DE83001728.

From 16. IEEE photovoltaics specialists conference; San Diego, CA, USA (28 Sep 1982).

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A high series resistnace is often associated with thick-film contacts on solar cells. A study of the thick-film silver/silicon interface of a single-crystal silicon solar cell is presented. Series and contact resistance measurements and scanning electron microscopy, in conjunction with hydrofluoric acid etching of cells, lead toward an understanding of the silver/silicon interface and of the barriers to current flow.

1954 **(SERI/TP—212-1738) Diffusion length and collection width for the evaluation of a-Si.** McMahon, T.J.; Konenkamp, R. (Solar Energy Research Inst., Golden, CO (USA); Tulane Univ., New Orleans, LA (USA)). Sep 1982. Contract AC02-77CH00178. 10p. (CONF-820906—5). NTIS, PC A02/MF A01. Order Number DE83000121.

From 16. IEEE photovoltaics specialists conference; San Diego, CA, USA (28 Sep 1982).

Using the liquid Schottky contact, the surface photovoltage technique is applied to a variety of glow discharge a-Si:H films to measure collection width, diffusion length and depletion width. These measures are also seen to be a sensitive method for studying light-soak changes. Finally, estimates of the density of states at the Fermi level have been made.

1955 **(SERI/TP—212-1749) Silicon electrorefining using a semipermeable Cu_3Si:Si anode.** Olson, J.M.; Carleton, K.; Kibbler, A. (Solar Energy Research Inst., Golden, CO (USA)). Sep 1982. Contract AC02-77CH00178. 7p. (CONF-820906—23). NTIS, PC A02/MF A01. Order Number DE83002095.

From 16. IEEE photovoltaics specialists conference; San Diego, CA, USA (28 Sep 1982).

Portions of document are illegible.

A silicon permeable anode material has been developed that significantly enhances the effectiveness of a molten salt silicon electrorefining process and permits the low temperature fabrication of silicon anode plates, a prerequisite for the operation of an efficient, multiple electrorefining process. Using metallurgical grade silicon (mgSi) as a feedstock, this hybrid process has yielded 99.9996+% pure silicon in a stable, poly- or single-crystalline form and is particularly effective at removing boron, phosphorus, aluminum, and iron.

1956 **(SERI/TR—9053-1-T7) Diagnostics of a glow discharge used to produce hydrogenated amorphous silicon films. Final report, April 15, 1982-April 14, 1983.** Gallagher, A.; Scott, J. (Colorado Univ., Boulder (USA)). 1982. Contract AC02-77CH00178. 27p. NTIS, PC A03/MF A01. Order Number DE82021245.

The amount of silane reacted in a discharge is studied. The dependence of the fraction of reacted silane and the product forms on discharge conditions is studied. Results indicate the criteria for rapid, efficient film deposition, and the discharge and flow conditions that induce major modifications of the gas and probably of the depositing species. The discharge energy efficiency is also obtained as well as silane-use efficiency in pure silane and silane-noble gas mixtures. In-situ film-deposition rate monitors have been developed and used to study deposition as a function of discharge conditions. Further study has concentrated on the discharge ion species and the collisional processes which control the mixture of ion species. It is confirmed that the ion deposition is a relatively small fraction of all silicon deposition in dc discharges. Total electron collisional ionization of silane and disilane were measured, as well as the partial cross sections for producing various product ions. Ion-molecule reactions are also measured. (LEW)

1957 **Plasma nitride AR coatings for silicon solar cells.** Sexton, F.W. (Sandia Labs., Albuquerque, NM). *Solar Energy Materials;* **7**: No. 1, 1-14(Jul-Aug 1982).

The criteria for the design of antireflection coatings for silicon solar cells are presented and used as a basis for optimizing plasma-assisted CVD nitride films. The effects of dispersion and absorption in the refractive index of silicon and plasma nitride are included through the use of a computer code which models the AR coating and optimizes its thickness under specified conditions. The influence of cell performance and its application on design of AR coatings is considered, along with nonuniformities in film thickness. The deposition conditions which give good uniformity are presented.

1958 **Characterization of electrodeposited silicon on graphite.** Rao, G.M.; Elwell, D.; Feigelson, R.S. (Stanford Univ., CA). *Solar Energy Materials;* **7**: No. 1, 15-21(Jul-Aug 1982).

An assessment is given of the suitability of electrodeposited silicon layers for fabrication into solar cells. Undoped samples are normally n-type with resistivity up to 3 Ω cm, carrier mobility of 100 $cm^2V^{-1}s^{-1}$, and carrier concentration of 10^{17} cm^{-3}. Laser annealing was found to enhance the apparent grain size and increase the carrier mobility when the laser power was around 11 W. This material shows good promise to meet the specifications for an inexpensive solar grade silicon layer.

1959 **Design of an antenna system for the collection of singlet excitation energy. Exciton diffusion among concentrated 9,10-diphenylanthracene centers in polystyrene.** Renschler, C.L.; Faulkner, L.R. (Univ. of Illinois, Urbana). *Journal of the American Chemical Society;* **104**: No. 12, 3315-3320(16 Jun 1982). Contract AC02-76ER01198.

Fluorescence decay kinetics of 9,10-diphenylanthracene (DPA) were examined at [DPA] = 16 to 181 mM in spin-cast polystyrene films of ~ 2000-A thickness. Exponential decays with lifetimes ranging from 6.94 ns at low concentration to 6.34 ns at 180 mM were observed in unquenched systems. In the presence of tetrabromo-o-benzoquinone (TBBQ), added at 12.0 mM as a quenching probe, the decay kinetics were modified. At very low concentrations of DPA, nearly pure Foerster kinetics were observed. Extrapolation of behavior to [DPA] = 0 gave a critical transfer radius for Foerster transfer from DPA to TBBQ of 28 A. Calculations from spectral data gave 29 A. As the concentration of DPA increased, quenching became progressively more efficient and the time dependence of decay showed evidence of excitation diffusion by hopping from DPA site to DPA site. Diffusion coefficients were evaluated by two-parameter fits of decays to curves predicted from the Yokota-Tanimoto theory based on a Pade approximant. Values of the diffusion coefficient increased with [DPA] to 7.9 x 10^{-6} cm^2/s at [DPA] = 180 mM. The corresponding diffusion length is 55 A. The meaning of the results to the construction of an antenna system for collection of photonic energy into photochemical reaction centers is discussed.

1960 **Cathodic deposition of amorphous alloys of silicon, carbon, and fluorine.** Lee, C.H.; Kroger, F.A. (Univ of South Calif, Los Angeles, USA). *Journal of the Electrochemical Society;* **129**: No. 5, 936-942(May 1982).

Amorphous silicon containing fluorine and carbon, pure and doped with boron or phosphorus, was deposited cathodically from solutions of K/sub 2/SiF/sub 6/ in acetone with HF. The conditions for optimum deposition were determined, and the deposits were characterized by electron microprobe x-ray emission, electrical conductivity, and infrared absorption. Doping with phosphorus causes a change from p- to n-type semiconductor behavior, with a maximum of resistivity >10/sup 13/ /OMEGA/ cm at the compensation point. 48 refs.

1961 **Electron microscopy of web-dendritic silicon.** Cunningham, B.; Strunk, H.; Ast, D.G. (Cornell Univ, Ithaca, NY, USA). *Journal of the Electrochemical Society;* **129**: No. 5, 1089-1093(May 1982).

The dislocation structure of WEB silicon ribbon is investigated using high-voltage transmission electron microscopy and scanning electron microscopy in the beam-induced current mode (EBIC). A high density dislocation network is present near the twin boundary region contained in the web and consists of perfect and partial dislocations. In particular straight dislocations lying in 110 directions can be Lomer-Cottrell locks, but are more frequently perfect glide or partial dislocations. 17 refs.

1962 **Preparation of Cu/sub x/S thin films by activated reactive evaporation technique.** Randhawa, H.S. (Univ. of California, Los Angeles); Bunshah, R.F.; Brock, D.G.; Basol, B.M.; Stafsudd, O.M. *Solar Energy Materials;* **6**: No. 4, 445-453(May-Jun 1982).

Thin films of cuprous sulphide (Cu_2S) have been deposited for the first time by a novel Activated Reactive Evaporation (ARE) technique. These films have been deposited as a function of various deposition conditions such as partial pressure of hydrogen sulphide gas, substrate temperature and copper evaporation rate. The microstructure of the films have been characterized by optical microscopy, transmission electron microscopy and electron diffraction. Electrical and optical characterization has also been carried out. Films deposited using, a H_2S partial pressure in the range from 10^{-2} to 8 x 10^{-4} Torr, a substrate temperature at or near room temperature and a copper evaporation rate of about 200 A/min, were found to consist of pure chalcocite (Cu_2S). Electrical and optical measurements of the pure Cu_2S films indicated that these films were p-type with carrier concentrations of 1 to 7 x 10^{20}/cm^3 and typical mobility values of 1 to 3 cm^2/V s. Mobilities as high as 8 cm^2/v s were measured on some samples. The optical determination of the band gap gave a value of E/sub g/ ≃ 1.2 eV. Preliminary investigation of the Cu_2S/CdS heterojunctions were also carried out using ARE deposited Cu_2S films on CdS films prepared by direct evaporation.

1963 **Fracture of directionally solidified multicrystalline silicon.** Chen, C.P.; Leipold, M.H. Jr.; Helmreich, D. (JPL, Pasadena, Calif, USA). *Journal of the American Ceramic Society;* **65**: No. 4, C.49(Apr 1982).

Fracture toughness data are given for multicrystalline silicon which has been prepared by directional solidification. Results indicated a K/sub IC/ of 0.8 to 0.87 MN/m/sup 3/2/, which is consistent with data for single-crystal silicon. Interest in silicon arises out of the need to ascertain its mechanical behavior in low-cost terres-

trial photovoltaic arrays, in which it will be subject to physical stresses. 7 refs.

1964 **Radiation protection louver.** Dueker, J.E.; Foster, R.C.; Whiteson, B.V. (to Department of the Air Force). US Patent Application 337,347. 6 Jan 1982. 14p.

This invention relates to radiation sensitive louvered systems constructed to shield a surface from the effects of rapid onset of high intensity radiation. Louvers of this type find application in space vehicle systems to shield surfaces as solar cell panels, thermal radiators, and the like, from high intensity radiation.

1965 **Kelp.** North, W.J. (Calif Inst of Technol, Pasadena, USA). *CHEMTECH;* 11: No. 5, 294-298(May 1981).

Several aspects of the kelp paint Macrocystis are discussed: sea farming, the biology of the plant, findings in the laboratory, and field studies. 19 refs.

1966 **Amylases: enzymatic mechanisms.** French, D. (Dept of Biochemistry and Biophysics, Iowa State Univ, Ames, IA 50011). pp 151-182 of Trends in the Biology of Fermentations for Fuels and Chemicals. Hollaender, A. (ed.). New York, NY; Plenum Press (1981).

From Trends in the biology of fermentations for fuels and chemicals; Upton, NY, USA (7 Dec 1980).

Utilization of starch by plants or by other organisms requires initial solubilization of the starch and conversion to dextrins and oligosaccharides by amylases. Various organisms have developed different strategies for starch breakdown, but all involve an initial attack by an amylase. Amylases are among the most effective enzymes known. The main classes of amylases are outlined and their biochemistry and mode of action discussed. (Refs. 75).

1967 **Trends in the biology of fermentations for fuels and chemicals.** Hollaender, A. (ed.). New York, NY; Plenum Press (1981). 603p. (CONF-801276—).

From Trends in the biology of fermentations for fuels and chemicals; Upton, NY, USA (7 Dec 1980).

One of the aims of this symposium was to look ahead and try to perceive some of the prospects for future fermentation technology with emphasis on the production of usable energy. Some of the topics covered include: biosynthesis of cellulases and other enzymes which degrade plant polymeric material; ethanol fermentation and ethanol tolerance in yeasts; biophotolysis of water by green algae; anaerobic fermentation of cellulose to methane; formation of hydrocarbons by bacteria and algae; and biochemical, microbiological and genetic aspects of these processes. Papers are abstrated separately.

1968 **(RFP-Trans—340) Electron-beam-welded segmental heat pipes of AlMgSi 1 for the thermal model of the satellite Aeros-A.** Hoell, H.; Lasar, H. Translated from *Praktiker ;* 9: 202-203(1974). Contract AC04-76DP03533. 6p. NTIS, PC A02/MF A01. Order Number DE82021036.

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For the purposes of tests with the thermal model of the German aeronomy satellite Aeros-A, a heat pipe system of optimized weight was developed in order to transport thermal energy from the solar cells of the cylindrical satellite to the conical bottom. Because of stringent requirements on the fabrication process, electron beam welding is used for bonding. The welding process is described and preliminary test results are given. (LEW)

1969 **(PB—82-187444) Process of deposition of single crystal silicon directly from the vapour phase. Final report.** Franzosi, A.; Giarda, L.; Pelosini, L. (Commission of the European Communities, Luxembourg). [nd]. 47p. (EUR—7093-EN). NTIS PC E03/MF E03.

The direct growth of silicon single crystal bars by chemical vapor deposition for polysilicon production and use in solar cells has been studied with regard to the influence of temperature, gas flow rate, reaction mixture and cooling rate on the external mantle as well as defect concentration, growth rate, and electrical properties. It was found that the hexagonal mantle, which is characteristic of low temperature deposition could become a feature of long deposition runs as well and that 'chevron' defects and the dislocation density could be controlled by pre-treatment of the seed and by the operating conditions. Having established that single crystal bars 2 cm thick, 40 cm long, and with a low density of macrodefects could be prepared, an economic analysis of the process was performed. It showed a substantial reduction in cost compared with the conventional CZ method, but no cost advantage over the new continuous ingot pulling technology.

1970 **(PB—82-196692) Development process of silicon films obtained by rheotaxy on tinned sheet for solar cells. Final report.** Peccoud, L.; Boselli, A. (Commission of the European Communities, Luxembourg). [nd]. 32p. NTIS PC E03/MF E03.

Methods for the production of polysilicon layers of 20 micrometers to 50 micrometers thickness for use in solar cells were investigated. Tinned graphite and Papyex graphite were chosen as the substrates, steel haing been found to be unsuitable. The effect of different parameters on silicon film growth were investigated. Details are given of the modifications made to the normal equipment for chemical vapor deposition in order to convert if from atmospheric pressure to low pressure use. Deposition of the boron-doped silicon layers at 50 torr was achieved by the process of 'rheotaxy', in which a thin liquid film is placed between the substrate and the silicon layer to increase the grain size of the latter. Before the suitability of the polysilicon layers for use in solar cells can be properly assessed, it will be necessary to devise effective methods of junction formation.

1971 **(DOE/RA/50330—1-Attach.2) New Energy Corporation of Indiana, final study report on construction of a fuel grade ethanol plant. Attachment 2: plant drawings.** (McKee (Davy) Corp., Chicago, IL (USA)). [nd]. Contract FG07-80RA50330. 158p. NTIS (US Sales Only). Order Number DE83000700.

Portions of document are illegible.

One hundred fifty-five drawings of plant plan, equipment, pipelines, and circuits are included.

1406 Photovoltaic Power Systems

REFER ALSO TO CITATION(S) 1884, 1885, 2002

1972 **(AD-A—112151/6) Lead-acid batteries in solar photovoltaic power systems for marine aids to navigation. Final report.** Trenchard, S.E. (Coast Guard Research and Development Center, Groton, CT (USA)). Oct 1981. 32p. (CGR/DC—29/81). NTIS, PC A03/MF A01.

Since 1974, the U.S. Coast Guard has been testing lead-acid batteries in solar photovoltaic-powered systems for aids to navigation. Three types of lead-acid batteries, distinguished by the composition of their grid material, have been tested: lead-antimony grid, lead-calcium grid, and pure-lead grid. This report contains a comparison of the charging characteristics and the charge-discharge cycling behavior of each grid type. All types were remarkably similar qualitatively in their daily as well as annual cycling behavior but the significance of the quantitative differences offer distinctive tradeoffs. This report presents models for water usage, depth-of-discharge, and post-cycle capacity for various levels of voltage regulation. Based on the post-cycle capacity tests, the effect of grid strength, grid thickness, and operating conditions on life expectancy are presented. A final discussion presents the results of a field deployment of solar photovoltaic-powered aids to navigation in the Miami, Florida area. Potential solutions to the battery terminal corrosion and bird guano problems observed are discussed.

1973 **(DOE/ET/20279—200) Data report for the Southwest Residential Experiment Station, April 1982.** Lieberman, M.; Durand, F.; Hocking, G.; Whitaker, C. (New Mexico State Univ., Las Cruces (USA). New Mexico Solar Energy Inst.; Massachusetts Inst. of Tech., Lexington (USA). Lincoln Lab.). 31 Aug 1982. Contract AC02-76ET20279. 30p. NTIS, PC A03/MF A01. Order Number DE83001847.

Portions of document are illegible.

Physical performance data obtained from the photovoltaic energy systems under test at the Southwest Residential Experiment

Station are tabulated for the month of April 1982. Eight prototype residential photovoltaic systems are under test, each consisting of a roof-mounted photovoltaic array sized to meet at least 50% of the annual electric demand of an energy-conserving house, and an enclosed structure to house the remainder of the photovoltaic equipment, test instrumentation, and work space. Each prototype system is grid connected. A brief monthly summary gives meteorological information, monitored house information for each house, and information on the photovoltaic array, power conditioning system, and energy flow between the photovoltaic system and utility for each prototype system. Hourly tabulations are provided for an average day of the month of electric energy used by each house, array and inverter output, load imposed on the prototype, energy supplied to and by the utility, maximum inverter AC power, total tilt insolation, and hypothetical energy flows to and from the utility if each prototype system were serving each monitored house. Daily inverter outputs are graphed for each prototype system. (LEW)

1974 **(DOE/ET/20279—226) Effect of operating-point-control strategy on the annual energy production of degraded photovoltaic arrays.** Branz, H.M. (Massachusetts Inst. of Tech., Lexington (USA). Lincoln Lab.). 1982. Contract AC02-76ET20279. 7p. (CONF-820906—11). NTIS, PC A02/MF A01. Order Number DE83001135.

From 16. IEEE photovoltaics specialists conference; San Diego, CA, USA (28 Sep 1982).

A new computer simulation of the annual operation of degraded flat-plate photovoltaic (PV) arrays is used to evaluate the need for maximum-power-point tracking in real PV systems. The simulations are based on single-glitch I-V curve shapes rather than particular array degradations, making the data reported applicable to any system whose likely failure modes are predictable and result in single-glitch I-V curves. The simulations show that with a reasonable array wiring strategy, effective maintenance, periodic I-V curve tracing, and avoidance of frequent and serious array shadowing, there is no reason that considerations of degradation should force the adoption of maximum-power-point-tracking power conditioning on a PV system that would otherwise operate economically at fixed voltage.

1975 **(ORNL/TM—8262) Model of the solar-power-supply system of the Mississippi County Community College.** Mullens, J.A. (Oak Ridge National Lab., TN (USA)). Oct 1982. Contract W-7405-ENG-26. 151p. NTIS, PC A08/MF A01. Order Number DE83001702.

Portions of document are illegible.

A digital computer program has been written to model the performance of the solar power system of the Mississippi County Community College campus in Arkansas. One year of operation was simulated in order to assess the capabilities of the power supply system. The model predicts that the system will be able to supply electricity as intended, but may have difficulty delivering heat at the design temperatures.

1976 **(SAND—81-7080/2) Intermediate photovoltaic system application experiment operational performance report. Volume 2 for G.N. Wilcox Memorial Hospital, Kauai, HI.** (Boeing Computer Services Co., Seattle, WA (USA)). Oct 1982. Contract AC04-76DP00789. 51p. NTIS, PC A04/MF A01. Order Number DE83002139.

Presented are the data accumulated during April and May 1982 at this intermediate photovoltaic project at G.N. Wilcox Memorial Hospital, Kauai, Hawaii. Generated energy and environmental (weather) data are presented graphically. Explanations of irregularities not attributable to weather are provided.

1977 **(SAND—81-7085/13) Intermediate photovoltaic system application experiment operational-performance report for Lovington Square Shopping Center, Lovington, New Mexico.** (Boeing Computer Services Co., Seattle, WA (USA)). Sep 1982. Contract AC04-76DP00789. 30p. NTIS, PC A03/MF A01. Order Number DE83000912.

Presented are the data accumulated during June at the intermediate photovoltaic project at Lovington Square Shopping Center, Lovington, New Mexico. Generated energy and environmental (weather) data are presented graphically. Explanations of irregularities not attributable to weather are provided.

1978 **(SAND—81-7091/3) Intermediate photovoltaic system application experiment operational performance report. Volume 3. For Mississippi County Community College, Blytheville, AK.** (Boeing Computer Services Co., Seattle, WA (USA)). Sep 1982. Contract AC04-76DP00789. 85p. NTIS, PC A05/MF A01. Order Number DE83000072.

Presented are the data accumulated during December 1981, January and February 1982 at the intermediate photovoltaic project at Mississippi County Community College, Blytheville, Arkansas. Generated energy and environmental (weather) data are presented graphically. Explanations of irregularities not attributable to weather are provided.

1979 **(SAND—82-0540C) Utility interface issues for grid-connected photovoltaic systems.** Chu, D.; Key, T.; Fitzer, J. (Sandia National Labs., Albuquerque, NM (USA); Texas Univ., Arlington (USA). Energy Systems Research Center). 1982. Contract AC04-76DP00789. 8p. (CONF-820906—26). NTIS, PC A02/MF A01. Order Number DE83000319.

From 16. IEEE photovoltaics specialists conference; San Diego, CA, USA (28 Sep 1982).

Photovoltaic (PV) balance-of-system research and development has focused on interconnection with the utility grid as the most-promising future application for photovoltaic-energy production. These systems must be compatible with the existing utility grid to be accepted. Compatibility encompasses many technical, economic, and institutional issues from lineman safety to revenue metering and power quality. DOE/PV-sponsored research is reviewed for two of the technical interconnection issues: harmonic injection and power-factor control. Explanations and rationale behind these two issues are discussed, progress toward resolution is reviewed, and plans for required future research work are presented.

1980 **(SAND—82-2119C) Microprocessor-controlled suntracker and load controller for photovoltaic concentrator array power systems.** Pritchard, D.A. (Sandia National Labs., Albuquerque, NM (USA)). 1982. Contract AC04-76DP00789. 9p. (CONF-820906—4). NTIS, PC A02/MF A01. Order Number DE82022163.

From 16. IEEE photovoltaics specialists conference; San Diego, CA, USA (28 Sep 1982).

Described are the design, development, and evaluation of a microcomputer-based solar tracking and control system (TACS) for a photovoltaic (PV) concentrator array. The TACS combines the function of sun tracking with the function of load adjustment for peak array efficiency. The complete PV array is used as the sun sensor. The TACS minimizes tracking errors caused by dust and dirt on shadow-band tracking systems, and minimizes the effects of structural warpage and sag that may occur in large arrays. A single-board computer with a specially designed input/output board controls array positioning by an orderly method of stepped movements and finds the peak power point by scanning the current-voltage curve of the array. The TACS was tested using a small two-axis tracking concentrator array. Test results show a deviation in maximum power of less than 1% during the day after accounting for other variations.

1981 **(SAND—82-2135C) Reporting of operational results from intermediate-sized photovoltaic systems.** Rogers, C.B.; Harrison, T.D.; Baxter, H.H.; Pruett, H.D. (Sandia National Labs., Albuquerque, NM (USA)). 1982. Contract AC04-76DP00789. 5p. (CONF-820906—21). NTIS, PC A02/MF A01. Order Number DE83001273.

From 16. IEEE photovoltaics specialists conference; San Diego, CA, USA (28 Sep 1982).

The performance of 12 intermediate-sized photovoltaic power systems are being evaluated by Sandia National Laboratories as part of the National Photovoltaic Program. The data collection system and the monthly summary reports issued for each system are described. Typical data plots for an example system are presented.

1982 **(SAND—82-2217C) Residential photovoltaic power conditioning technology for grid connected applications.** Key, T.S.; Klein, J.W. (Sandia National Labs., Albuquerque, NM (USA); Jet Propulsion Lab., Pasadena, CA (USA)). 1982. Contract AC04-76DP00789. 3p. (CONF-820906—16). NTIS, PC A02/MF A01. Order Number DE83000325.

From 16. IEEE photovoltaics specialists conference; San Diego, CA, USA (28 Sep 1982).

Several major advances in the area of power conditioning for residential application were made during the last 12 months. This paper summarizes the current status of the technology and reviews potential for future performance and cost improvement. The power conditioners of interest are single-phase, grid-connected in the 2 to 10 kW size range.

1983 **(SERI/TP—254-1739) On-site use and sellback in residential photovoltaic systems, based on monitored residential-load data.** Sillman, S. (Solar Energy Research Inst., Golden, CO (USA)). Oct 1982. Contract AC02-77CH00178. 7p. (CONF-820906—17). NTIS (US Sales Only). Order Number DE83001712.

From 16. IEEE photovoltaics specialists conference; San Diego, CA, USA (28 Sep 1982).

Portions of document are illegible.

The question of direct on-site use of photovoltaic (PV) power in grid-connected residential PV systems is addressed. Calculation of on-site use and utility sellback depends largely on how the residential load is characterized. In this study, a probabilistic model is used to predict the residential load pattern. Predicted load patterns are then compared with extensive monitored residential load data from the Northwest Residential Experiment Station, and the resulting load pattern is used to calculate on-site use and sellback. Conclusions are that in typical grid-connected applications, with an array size of 3 kW or larger, 50% or more of generated PV power is sold to the utility, unless some form of on-site storage is included. The effect of load management strategies on on-site use of PV power is also addressed.

1984 **Design and construction of a concentrating photovoltaic total energy system in Hawaii.** Rafinejad, D.; Spencer, R. (Acurex Corp., Mountain View, CA). *American Institute of Aeronautics and Astronautics Monographs;* No. 82-0069, 1-8(Jan 1982). (CONF-820106—).

From 20. aerospace science conference; Orlando, FL, USA (11 Jan 1982).

Design and construction of Hawaii's largest solar energy system are described. The project was sponsored by the U.S. Department of Energy and the State of Hawaii and was designed and constructed by Acurex Corporation. The system generates 35 kW of DC power at 1,000 W/sqm insolation. The major subsystems are the collector field, thermal energy subsystem, and electrical power generation. The photovoltaic (PV) collector field consists of 4,800 sq ft of parabolic linear focus concentrators. The linear receiver is populated with PV cells and is actively cooled. Project construction is complete and the system is currently being commissioned.

1407 Solar Thermal Power Systems

REFER ALSO TO CITATION(S) 2005, 2527

1985 **(BMFT-FB-T—82-047) Final report phase C of the German contributions to the 1 MWsub(el)-solar-tower-plant of the European Communities EURELIOS.** Hofmann, J.; Schober, E. (Bundesministerium fuer Forschung und Technologie, Bonn (Germany, F.R.)). Apr 1982. 54p. (In German). NTIS (US Sales Only), PC A04/MF A01. Order Number DE82750642.

Phase C of the EURELIOS solar power plant in Adrano/Sicily finished for MBB with the installation and acceptance of the heliostat field. The whole plant was finalized during the same period and operation initiated by stepwise experimentation and operation of the subsystems. Finally the complete system was operated first under simulated conditions, then in solar operating mode. The heliostat field itself proofed its complete functional maturity during several month and quasi-operational conditions.

1986 **(DOE/JPL—1060-53-Vol.1) Solar-thermal technology. Annual technical progress report FY 1981. Volume I. Executive summary.** (Jet Propulsion Lab., Pasadena, CA (USA)). Jun 1982. Contract AI01-76ET20307. 12p. NTIS, PC A02/MF A01. Order Number DE83001329.

The DOE Solar Thermal Technology Program is developing five types of solar thermal concepts, each aimed at specific applications: the central receiver, parabolic dish, parabolic trough, hemispherical bowl, and salt-gradient solar pond. After brief descriptions of each concept, their potential applications and current status are discussed. FY 81 accomplishments are then briefly summarized for each of the five concepts, and research and advanced development efforts are briefly discussed in the areas of materials research, fuels and chemicals, and applied thermal research. (LEW)

1987 **(DOE/JPL—1060-53-Vol.2) Solar-thermal technology. Annual technical progress report FY 1981. Volume II. Technical.** (Jet Propulsion Lab., Pasadena, CA (USA)). Jun 1982. Contract AI01-76ET20307. 113p. NTIS, PC A06/MF A01. Order Number DE83001330.

After a brief description of the Solar Thermal Technology Program, its goals, objectives, and benefits, progress is reported in the five technologies addressed by the program: central receiver, parabolic dish, parabolic trough, hemispherical bowl, and salt-gradient solar ponds. Component technology development and systems experiments and analyses are reported for the central receiver, parabolic dish, and parabolic trough concepts. Also reported are test programs at the Central Receiver Test Facility, Parabolic Dish Test Site support to dish development, and experiments at test facilities supporting parabolic trough program. Research on hemispherical bowl and salt-gradient solar ponds is briefly summarized, including the Crosbyton Solar Power Project (hemispherical bowl) and the Salton Sea Project (solar pond). Also reported are research and advanced development efforts in materials research, fuels and chemicals, and applied thermal research, and supporting programs, including the Solar Thermal Test Facilities Users Association activities, environmental control studies, and solar thermal insolation assessment. (LEW)

1988 **(DOE/SF/11492—T7) Solar-energy treatment of ceramic tile. Final report.** Harris, J.N.; Clayton, M.E. (Georgia Inst. of Tech., Atlanta (USA). Engineering Experiment Station). Dec 1981. Contract AC03-81SF11492. 92p. NTIS, PC A05/MF A01. Order Number DE83000147.

Portions of document are illegible.

The 400 kW Advanced Components Test Facility was used to provide a concentrated source of solar energy for firing ceramic wall tile. A domed top cylindrical cavity with a white refractory fiber lining provided diffuse reflection of the concentrated solar beam directly onto the upper surface of the unfired wall tile. The tile were placed directly on the cavity floor in a circular pattern, centered at 45° intervals so that eight tile could be fired at one time. The tile and cavity walls were instrumented with thermocouples, and pyrometric cones were used to determine temperature distribution within the cavity. The glazed and unglazed solar fired tiles were subjected to standard ceramic testing procedures to determine: flatness, modulus of rupture, water absorption, porosity, bulk density, apparent specific gravity, percent linear thermal expansion and crystalline phases present in the fired bodies. These data were compared with the same data for commercial fired tiles from the same batch of raw materials. The glazed tile surfaces were compared with commercially fired tile for reflectance and color match. The major problems encountered were: cracking by thermal shock, and uneven shrinkage and glaze maturity across individual tile. The cavity also failed to provide even heating at all eight tile positions. An alternate air heat exchanger system is recommended to fire the tile by convection rather than direct radiation.

1989 **(STTFUA—81-19) Solar-Thermal Test Facilities Users Association final report, October 1, 1980-April 30, 1982.** Smith, F.B. (Houston Univ., TX (USA)). May 1982. Contract AC03-81SF11492. 53p. NTIS, PC A04/MF A01. Order Number DE83000146.

Major accomplishments reported include completion of the proposal review cycle which began with the issuance of a Solar

High-Temperature Research program announcement on April 30, 1980. Recommendations for funding of the proposals are listed. Brief descriptions and agendas are given for workshops and meetings sponsored by the Users Association. Also included are a list of publications, a copy of the association newsletter, FOCUS, and a list of presentations given during the period reported. Administrative efforts are also described, including the drafting of new objectives, roles, and responsibilities. SSTFUA associates for 1981 and 1982 are listed, and the budget is briefly summarized. (LEW)

1408 Ocean Thermal Gradient And Salinity Gradient Power Systems

1990 **(DOE/ET/20310—13) Biofouling and corrosion studies. Final report, Part II, January 1, 1978-October 31, 1979.** Fetkovich, J.G. (Carnegie-Mellon Univ., Pittsburgh, PA (USA)). 1979. Contract AC02-76ET20310. 220p. (COO—4041-13). NTIS, PC A10/MF A01. Order Number DE83001011.

Portions of document are illegible.

Data were analyzed from two experiments off Keahole Point in Hawaii, one on a tugboat moored in the Gulf of Mexico, and two on buoys in the Gulf of Mexico. These data gave heat transfer behavior of different heat exchanger materials in order to determine the degree of biofouling. A computer program used to analyze the data from the Keahole Point experiments was modified to facilitate the rejection of bad data and analysis of good data with much less manual editing. A program was written for a programmable calculator to allow quick calculation of heat transfer coefficients from raw data. Interpretation of biofouling data is discussed, and a physical model is developed which, it is shown, represents the data. (LEW)

1991 **(SERI/TP—252-1596) Performance and stability of the mist-lift process for open-cycle OTEC.** Davenport, R.L.; Johnson, D. (Solar Energy Research Inst., Golden, CO (USA)). Sep 1982. Contract AC02-77CH00178. 15p. (CONF-821101—11). NTIS, PC A02/MF A01. Order Number DE83000450.

From ASME winter annual meeting; Pheonix, AZ, USA (14 Nov 1982).

Portions of document are illegible.

Presented are the results of SERI's analytical studies of the mist-lift process for open-cycle OTEC. Results of a multiple-drop-size model that considers collisions and coalescence of drops indicate that drop growth is rapid. Results from an improved model that includes breakup of drops as well as coalescence indicate that drops tend to grow rapidly to a mean diameter of about 0.5 mm and that collisions prevent the drops from growing much larger than a few millimetres. Parametric studies performed using a single-drop-size model have indicated that the mist-lift process will perform under a variety of conditions. Important considerations for the design of mist-lift tube have also been identified as a result of these studies. Results of a transient mist-lift model indicate that the mist-flow process is stable to perturbations in operating condtions, as long as the conditions remain within the steady-state operational envelope for the particular mist-lift tube under study.

1409 Solar Thermal Utilization

REFER ALSO TO CITATION(S) 1975, 1976, 1984, 1986, 1987, 1988, 2379, 2453, 2462, 2527, 2528

1992 **(BMFT-FB-T—82-029) Solar equipment system packages for old and new buildings to provide domestic water and partial heating.** Berg, G.; Mueller, F.J. (Bundesministerium fuer Forschung und Technologie, Bonn (Germany, F.R.)). Mar 1982. 87p. (In German). NTIS (US Sales Only), PC A05/MF A01. Order Number DE82750554.

The inspected commercial solar collectors for heating of domestic water and space heating from 1977/78 failed in an long-time-test. From architectural viewpoint it is difficult to integrate the collectors into roof- or wall surfaces due to its typical box-design. Satisfactory integration may only be achievable by combined planning of the collector design and of the new building. A suitable highly efficient plastic collector with long service life would have high expenditure with conventional construction. An essentially improved relation of advantage to cost is provided by the new developed, flexible mat-shaped plastic absorber with fully wetted surface, which is operated by pressure below atmospheric. The operation of a pilot plant - a bivalent heat-pump system - delivered the proof of its capability. For the system package concerning the absorber circuit and for the heat-pump system the design data were made available.

1993 **(BNL—51564) Steady-state testing of an advanced solar-assisted heat pump.** Catan, M.A. (Brookhaven National Lab., Upton, NY (USA)). Jun 1982. Contract AC02-76CH00016. 18p. NTIS, PC A02/MF A01. Order Number DE83002343.

A prototype water-to-air solar assisted heat pump (SAHP) has been tested under steady state conditions. The results of the tests indicate that the nominal goal for the hardware portion of the contract was achieved and surpassed. The tests show some areas of potential improvement, which are discussed.

1994 **(CONF-810125—3) Active space heating and hot water supply with solar energy.** Karaki, S.; Loef, G.O.G. (Colorado State Univ., Fort Collins (USA). Solar Energy Applications Lab.). Apr 1981. Contract FC02-79CS30278. 36p. NTIS, PC A03/MF A01. Order Number DE83001130.

From Solar technology assessment conference; Orlando, FL, USA (29 Jan 1981).

Technical and economic assessments are given of solar water heaters, both circulating, and of air-based and liquid-based solar space heating systems. Both new and retrofit systems are considered. The technical status of flat-plate and evacuated tube collectors and of thermal storage is also covered. Non-technical factors are also briefly discussed, including the participants in the use of solar heat, incentives and deterrents. Policy implications are considered as regards acceleration of solar use, goals for solar use, means for achieving goals, and interaction of governments, suppliers, and users. Government actions are recommended. (LEW)

1995 **(CONF-810125—4) Solar air-conditioning-active, hybrid and passive.** Yellott, J.I. (Arizona State Univ., Tempe (USA). Coll. of Architecture). Apr 1981. Contract FC02-79CS30278. 59p. NTIS, PC A04/MF A01. Order Number DE83001131.

From Solar technology assessment conference; Orlando, FL, USA (29 Jan 1981).

Portions of document are illegible.

After a discussion of summer air conditioning requirements in the United States, active, hybrid, and passive cooling systems are defined. Active processes and systems include absorption, Rankine cycle, and a small variety of miscellaneous systems. The hybrid solar cooling and dehumidification technology of desiccation is covered as well as evaporative cooling. The passive solar cooling processes covered include convective, radiative and evaporative cooling. Federal and state involvement in solar cooling is then discussed. (LEW)

1996 **(CONF-810125—5) Solar industrial process heat.** Lumsdaine, E. (Tennessee Univ., Knoxville (USA). Energy, Environment and Resources Center). Apr 1981. Contract FC02-79CS30278. 83p. NTIS, PC A05/MF A01. Order Number DE83001132.

From Solar technology assessment conference; Orlando, FL, USA (29 Jan 1981).

Portions of document are illegible.

The aim of the assessment reported is to candidly examine the contribution that solar industrial process heat (SIPH) is realistically able to make in the near and long-term energy futures of the United States. The performance history of government and privately funded SIPH demonstration programs, 15 of which are briefly summarized, and the present status of SIPH technology are discussed. The technical and performance characteristics of solar industrial process heat plants and equipment are reviewed, as well as evaluating how the operating experience of over a dozen SIPH demonstration projects is influencing institutional acceptance and

economoc projections. Implications for domestic energy policy and international implications are briefly discussed. (LEW)

1997 **(CONF-810125—6) Passive solar technology.** Watson, D. (Yale Univ., New Haven, CT (USA)). Apr 1981. Contract FC02-79CS30278. 61p. NTIS, PC A04/MF A01. Order Number DE83000811.

From Solar technology assessment conference; Orlando, FL, USA (29 Jan 1981).

Portions of document are illegible.

The present status of passive solar technology is summarized, including passive solar heating, cooling and daylighting. The key roles of the passive solar system designer and of innovation in the building industry are described. After definitions of passive design and a summary of passive design principles are given, performance and costs of passive solar technology are discussed. Passive energy design concepts or methods are then considered in the context of the overall process by which building decisions are made to achieve the integration of new techniques into conventional design. (LEW).

1998 **(CONF-820264—1) Solar furnace preparation of elemental phosphorus.** Whaley, T.P.; Yudow, B.D.; Schreiber, J.D. (Institute of Gas Technology, Chicago, IL (USA)). 1982. 7p. NTIS, PC A02/MF A01.

From AIChE winter meeting; Orlando, FL, USA (28 Feb 1982).

The use of a solar furnace to produce elemental phosphorus by the reaction of phosphate rock, silica, and carbon has been demonstrated. All experimental runs were characterized by a considerable amount of impurities evolving from the reaction vessel at higher temperatures that condensed on the quartz window and other cooler surfaces. (LEW)

1999 **(DOE/CE/30742—1) Advanced performance monitoring and analysis for the Johnson Controls Branch Office and Security State Bank.** Hartman, T. (ESG, Inc., Atlanta, GA (USA)). 1982. Contract AC02-82CE30742. 4p. (CONF-820940—6). NTIS, PC A02/MF A01. Order Number DE83001797.

From Passive and hybrid solar energy update conference; Washington, DC, USA (15 Sep 1982).

Initial work has started on a project to conduct performance monitoring and analysis on two passive solar commercial buildings: the Johnson Controls Branh Office, Salt Lake City, Utah and the Security State Bank, Wells, Minnesota. This project will use intensive performance monitoring (over limited time spans), computer modelling, and daylighting analysis to generate extensive quantitative information. This includes the current performance of these buildings versus the design predictions; suitability of the design performance if new materials and components are utilized. The philosophy of the project, how the work is to be carried out and integrated, and the types of results that are expected are described.

2000 **(DOE/CE/30742—2) Project status report on passive-solar commercial buildings project, July 20-September 30, 1982.** (ESG, Inc., Atlanta, GA (USA)). Oct 1982. Contract AC02-82CE30742. 10p. NTIS, PC A02/MF A01. Order Number DE83001796.

Progress on the Passive Solar Commercial Buildings Project is reported on in the three major task areas: computer modeling; daylighting analysis; and performance monitoring. This includes discussion of efforts to review drawings, design reports, and specifications for both subject buildings, and development of initial BLAST 3.0 input deck. The procedures for constructing and testing the architectural models are outlined. Criteria for determining appropriate data acquisition systems are also discussed. Upcoming efforts in each of the task areas are also discussed. Attention is also given to ESG efforts to properly coordinate the project with other parties of interest who include Los Alamos Scientific Laboratory and Princeton University Center for Energy and Environmental Research.

2001 **(DOE/CH/10122—6) Field research tasks and technical services. Project status report, June 1-August 31, 1982.** (ESG, Inc., Atlanta, GA (USA)). Sep 1982. Contract AC02-82CH10122. 32p. NTIS, PC A03/MF A01. Order Number DE83001115.

Emphasis was placed on analysis efforts for passive design tools, industry review of the initial performance monitoring data on the 160 hot water systems that are under test, and the work concerned with residential PV systems. Of particular importance was the completion of a report covering analysis of residential PV systems integrated with on-site thermal storage. This work shows that some advantage may result in hot, humid climates where there is more of a load balance throughout the year because of the relatively constant cooling load. Effort was started on the evaluation of completed Midwest AT projects, analysis from a management viewpoint, and preparation for more detailed monitoring and technical assistance to grantees. A listing of documents produced during the reporting period is included and materials defining the work which was accomplished are provided.

2002 **(DOE/CH/10122—6) Field research tasks and technical services. Project status report, June 1-August 31, 1981.** (ESG, Inc., Atlanta, GA (USA)). Sep 1982. Contract AC02-82CH10122. 31p. NTIS, PC A03/MF A01. Order Number DE83001146.

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In Field Measurements, Analyses, and Reporting Related to Building Energy Systems and Biomass Projects, sound progress was made in all areas, although the buildup of effort was delayed somewhat because of work under other contracts, and a less rapid transition of personnel than had been originally anticipated. Emphasis was placed on analysis efforts for passive design tools, industry review of the initial performance monitoring data on the 160 hot water systems that are under test, and the work concerned with residential PV systems. Of particular importance was the completion of a report covering analysis of residential PV systems integrated with on-site thermal storage. This work shows that some advantage may result in hot, humid climates where there is more of a load balance throughout the year because of the relatively constant cooling load. Technical Services in Support of Appropriate Technology Program, effort was started on the evaluation of completed Midwest AT projects, analysis from a management viewpoint, and preparation for more detailed monitoring and technical assistance to grantees. This report includes a listing of documents produced during the reporting period and provides materials defining the work which was accomplished.

2003 **(DOE/CS/30533—1) Passively operated spool valve for drain-down freeze protection of thermosyphon water heaters. Final technical report.** (Sunspool Corp., Palo Alto, CA (USA)). 30 Apr 1982. Contract FC02-80CS30533. 95p. NTIS, PC A05/MF A01. Order Number DE83001015.

Portions of document are illegible.

The work done to extend the existing drain-down valve technology to provide passive drain-down freeze protection for thermosyphon-based solar water heaters is described. The basic design of the existing valve model is that of a spool valve, employing a cylindrical spool which moves axially in a mating cartridge to open and close o-rings at the two operating extremes (drain and operate) to perform the valving function. Three passive actuators to drive the basic valving mechanism were designed, fabricated, and tested. Two piping configurations used to integrate the spool valve with the thermosyphon system are described, as are the passive actuators. The three actuator designs are: photovoltaic driven, refrigerant-based bellows, and heat motor cable-drive designs. Costs are compared for the alternative actuator designs, and operating characteristics were examined for the thermosyphon system, including field tests. The market for the valve for thermosyphon systems is then assessed. (LEW)

2004 **(DOE/CS/30661—T1) Estimating the regional economic impacts of solar-energy developments with linked input-output and econometric models.** Kort, J.R.; Beemiller, R.M. (Department of Commerce, Washington, DC (USA). Bureau of Economic Analysis). Sep 1982. Contract AI01-81CS30661. 88p. NTIS (US Sales Only). Order Number DE82021281.

Developments in five solar technologies for the residential and commercial market sectors are emphasized: solar water heating; solar water and space heating; solar cooling, water, and space heating; passive; and photovoltaics. This study adapts two regional economic models to provide estimates of the regional economic models to provide estimates of the regional economic impacts of solar energy development during the next decade, and then evaluates the reasonableness of these impact estimates.

2005 **(DOE/RA/20322—1) Mid-South solar total energy: institutional analysis. Final report, May 1, 1978-December 31, 1979.** Powe, R.E.; Carley, C.T.; Forbes, R.E.; Johnson, L.R.; Stiffler, A.K.; Hodge, B.K.; Bouchillon, C.W. (Mississippi State Univ., Mississippi State (USA). Energy Research Center). 1979. Contract AS05-78ET20322. 186p. D. Order Number DE83001649.

Portions of document are illegible.

A comprehensive survey was undertaken to determine the current usage of energy by the Mississippi State University, considering electricity and fuel separately. A variety of individual components likely to be employed in total energy systems are then considered in detail, including: solar assisted space heating system, space cooling system design, solar electric system, flat plate solar collector system, central solar receiver, and geothermal heat pump system. Also, algorithms have been developed for the approximate prediction of building heating and cooling loads based on gross parameters such as floor area, type of wall construction, etc. System considerations and evaluation are then presented. (LEW)

2006 **(DOE/SF/11492—T3) Solar production of elemental phosphorus. Final report.** Whaley, T.P.; Yudow, B.D.; Schreiber, J.D. (Institute of Gas Technology, Chicago, IL (USA)). Nov 1981. Contract AC03-81SF11492. 70p. NTIS, PC A04/MF A01. Order Number DE83000048.

Elemental phosphorus is produced commercially by heating a mixture of phosphate rock (fluorapatite), silica sand, and carbon (coke) to approximately 1500°C in an electric arc furnace. The project described was carried out to determine the technical feasibility of using a solar furnace to produce elemental phosphorus and to provide guidelines for future reactor designs. Four successful solar furnace runs were carried out at the White Sands (New Mexico) solar furnace. Elementary phosphorus was produced at 1300° to 1500°C in all four runs, but converted to phosphate by reaction with copper sulfate solution in a bubbler train. No attempt was made to carry the reactions to completion, and temperature measurements were too erratic to attempt any quantitative rate determinations. In all cases, the solution in the primary bubbler contained considerable quantities of free copper powder as determined later by analysis. (All solutions in the primary bubblers were filtered, and the solids saved for analysis.) The pH of the filtrates varied from 2 to less than 1 which was in agreement with the formation of sulfuric/phosphoric acids by reaction of phosphorus with $CuSO_4$ solution. The reaction vessel contained melted slag, as further evidence of the reaction.

2007 **(EUR—7702-EN) First phase of the solar Pilot Test Facility project. Final report.** Nielsen, C. (Danmarks Tekniske Hoejskole, Lyngby. Lab. for Varmeisolering). 1982. 41p. European Community Information Service, 2100 M Street NW, Suite 707, Washington, DC 20037.

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The aim of the Pilot Test Facility (PTF) project is to develop solar heating systems and to obtain more accurate computer models by means of controlled exact measurements to calculate the output of a solar system chosen at random. The facility itself consists of a rig for mounting the collectors and a house in which the accumulating tank and the measuring equipment are placed. The first phase, now concluded, comprised construction of the rig and the house and setting up the solar system and making it all run. One system is constructed primarily for house heating and can be used for basic investigations concerning the influence of the climate on the efficiency of a solar energy system. A second solar heating system has been made to give a supplement to both heating of rooms and for domestic hot water. Each of these systems are described, including a single solar collector, the collector array, and primary and secondary circuits. Two different systems, one for each solar heating system, have been built for simulating every sort of heating system with the solar systems. (LEW)

2008 **(LA—9424-MS) Annual thermal performance of sunspace-type passive-solar collectors for residence heating: attached and semi-enclosed geometries.** McFarland, R.D.; Jones, R.W.; Lazarus, G.S. (Los Alamos National Lab., NM (USA)). Sep 1982. Contract W-7405-ENG-36. 79p. NTIS, PC A05/MF A01. Order Number DE83002310.

The sunspace is an important category of passive solar system for heating small- and moderate-sized buildings. There is a wide variety of possible geometries of sunspaces, and a few of these have been analyzed to obtain simplified annual performance-estimation equations in the form of solar load ratio correlations. This report summarizes the details and correlations of all of the configurations analyzed to date and presents related work not published elsewhere.

2009 **(LA—9473-PR) Solar-energy research at Los Alamos. Progress report, April 1-September 30, 1981.** Reisfeld, S.K.; Neeper, D.A. (comps.). (Los Alamos National Lab., NM (USA)). Sep 1982. Contract W-7405-ENG-36. 101p. NTIS, PC A06/MF A01. Order Number DE83002302.

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Solar energy research for the period April 1-September 30, 1981 by the Los Alamos National Laboratory's Solar Energy Group, in the areas of collectors, materials R and D, and passive systems research, is described. Accounts are also given of the Group's technical support to the Office of Solar Heat Technologies, US Department of Energy, and of technology transfer to the scientific community, building industry, government departments, and the general public.

2010 **(NP—3900290) Inexpensive solar water heater you can build. Publication C-188.** Herndon, L.P.; Hill, G.C. (Nevada Univ., Reno (USA). Max C. Fleischmann Coll. of Agriculture). 1982. 31p. NTIS, PC A03/MF A01. Order Number DE83900290.

Directions are given for constructing a home-made solar water heater that is expected to supply over 50% of the hot water for a family of 3 or 4. System cost is estimated at $250.00. The system utilizes three 2 x 8-foot solar panels. Hot water from the panels is pumped through a preheat-storage tank where it heats domestic water. The preheated water is then drawn into the cold water inlet of the regular home water heater. The pump which circulates the fluid is controlled by a differential thermostat which turns it on when the solar panels become hotter than the water in the preheat-storage tank. The collector panel design, construction, assembly, and installation are described in detail, as are the heat exchanger and storage tank. A thermosiphon system design is also briefly outlined. Sources of necessary materials are given as well as a list of needed materials, miscellaneous supplies, and major tools. Finally, the research and experimental work leading to the design is described, including the testing of models. (LEW)

2011 **(PB—82-180332) Market diffusion and the effect of demonstrations: a study of the Denver Metro Passive Solar Home Program. Final report.** Lilien, G.L. (Massachusetts Inst. of Tech., Cambridge (USA). Energy Lab.). Oct 1981. 43p. (MIT-EL—81-040). NTIS, PC A03/MF A01.

This report discusses the reactions to and effects of the Denver Metro Passive Solar Home demonstration program, conducted in the spring of 1981. The purpose of the program was to provide impetus to builders for incorporating passive solar designs in spec-built homes and to demonstrate those designs to prospective buyers to increase buyer-receptivity. A pre-post exposure analysis of the effect of the program is reported on here, with four separate

groups of prospective new home buyers studied. The first group heard publicity about and voluntarily visited a demonstration home. The second group saw the home, but was recruited to come to the site. The third group, also in Denver, did not see the site, but answered the same set of questions after receiving a description of and pictures of passive solar homes. The fourth group was a control group, similar to the third, but located in Kansas City. A total of 245 individuals participated.

2012 **Solar opportunities - domestic and international.** San Martin, R. (U.S. Department of Energy, Washington, DC). pp 6.23-6.36 of New era in technology. Cocoa Beach, FL; Canaveral Council of Technical Societies (1980).

From 17. space congress; Cocoa Beach, FL, USA (30 Apr 1980).

The Department of Energy management approach for the solar and conservation activities is described, emphasizing the role of the Solar Energy Research Institute, Regional Solar Energy Centers, and Solar International Programs. It is shown how these diverse activities are brought together using a management approach which is similar to the NASA model.

1410 Solar Collectors And Concentrators

REFER ALSO TO CITATION(S) 1881, 1986, 1987, 2009

2013 **(BMFT-FB-T—82-045) Development of fluorescent systems for use in displays and concentrators of solar energy.** Claussen, U. (Bundesministerium fuer Forschung und Technologie, Bonn (Germany, F.R.)). Apr 1982. 26p. (In German). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82750641.

For application in fluorescence activated displays an assortment of dyes with very high light-fastness has been developed. It could be used as a basis for marketable products, when demands on luminescence are not particularily high. These compounds are of limited value for collecting scattered light, because in this case extreme light-fastness as well as extreme luminescence are required. A perylene-derivated dye with good luminescence properties has been synthesized, but the light-fastness was poor. This gives rise to a particular problem with optimization, because as a rule both maximum properties exclude each other. To overcome these difficulties the optimization of the system dye/polymer is necessary. New analytical methods are to be developed, the ultra short-time spectroscopy is introduced as a suitable analytical tool. Dyestuffs from this development will be commercialised as light collecting plastics (LISA-Plastics).

2014 **(BMFT-FB-T—82-059) Development of industrial production processes for components of solar heating systems, especially solar collectors.** Moeller, M. (Bundesministerium fuer Forschung und Technologie, Bonn (Germany, F.R.)). Apr 1982. 120p. (In German). NTIS (US Sales Only), PC A06/MF A01. Order Number DE82750650.

The project ET 4051 has been carried out under the management of Metallgesellschaft AG in cooperation with the companies Dornier System GmbH, Kloeckner + Co., and Schott + Gen. The results of the different project parts are treated in a summarizing report. The development objects have been reached, so that we are now in a position to manufacture on an industrial scale solar collectors as well as components for solar heating system with a long service life.

2015 **(EIR—423) Energy yields and characteristics of solar collectors.** Keller, J.; Kyburz, V. (Eidgenoessisches Inst. fuer Reaktorforschung, Wuerenlingen (Switzerland)). Apr 1981. 99p. (In German). NTIS (US Sales Only), PC A05/MF A01. Order Number DE82750639.

The present EIR report N° 423 is a summary of the test results gained from the solar collectors tested in 1980. Apart from the 16 collectors tested under contract two flat plate collectors serving as references as well as two evacuated tube collectors were investigated within the framework of the International Energy Agency. The report permits a comparison of the heat performances of the different products basing on measured optical and thermal characteristic data. The set-up of the test stand as well as the test method applied are described in the appendix. Furthermore, a method for the calculation of the gross heat yields of solar collectors developed at the EIR is briefly dealt with. Then the characteristics of the reference collectors in dependence of the test period are examined and their part in assessing the results of the individual collector charges is explained. Moreover, a description of the spectrophotometer is added. The addresses of the collector manufacturers or distributors are listed.

2016 **(EIR—427) Tables for determining the heat yield for solar collectors in selected climatic regions of Switzerland.** Widder, F. (Eidgenoessisches Inst. fuer Reaktorforschung, Wuerenlingen (Switzerland)). May 1981. 116p. (In German). NTIS (US Sales Only), PC A06/MF A01. Order Number DE82750658.

Tables are presented of the mean on the mean energy yield of solar collectors in dependence of the characteristic quantities A_o (optical efficiency for vertical insolation) and K_o (thermal loss factor for small differences between operating temperature and ambient temperature). On the basis of these data, mean gross heat yields per month can be calculated quickly and easily for the follwing cases: Collector type: Single-glazed flat plate collectors, double-glazed flat plate collectors, concentrating follow-up collectors without glass covers (concentration factor: 8) Orientation: South, south-east, south-west; Angle of inclination: 0, 30, 45, 60, 90 degrees; Operating temperature: 20, 40, 60°C; Stations: Kloten (airport), Davos (Platz), Locarno (Monti).

2017 **(PB—82-188095) The durability of solar collectors: experience from surveys of swedish solar collector installations, 1979-1980.** Lagerkvist, K.; Wennerholm, H. (Statens Raad foer Byggnadsforskning, Stockholm (Sweden)). 1982. 64p. NTIS, PC A04/MF A01.

34 solar heating installations were surveyed during the autumn of 1979 and spring of 1980, with a view to identifying damage occurring to solar collectors and problems related to their design and materials, and of attempting to ascertain the reasons therefor. The installations which were investigated had been in operation from periods ranging from about a month to up to about five years.

2018 **(SAND—81-7029) Solar-collector materials exposure to the IPH site environment. Task 5.0. Final report.** Morris, V.L. (McDonnell Douglas Astronautics Co., Huntington Beach, CA (USA)). Jul 1982. Contract AC04-76DP00789. 68p. NTIS, PC A04/MF A01. Order Number DE83002192.

Portions of document are illegible.

An in-situ environmental exposure test was conducted at Texfel Petroleum Company, Bakersfield, CA. This site utilizes solar energy for enhanced oil recovery procedures. Two types of reflector materials were evaluated for survivability in this environment: second-surface silvered glass and aluminized acrylic (FEK-244) on an aluminum substrate. Black chrome absorber material and low-iron float glass were evaluated for thermal, photochemical, and environmental degradation. The reflector specimens were monitored for decreases in specular and hemispherical reflectance due to soil buildup. The absorber material was evaluated for changes in solar absorptivity and emissivity and the glass cover plates were evaluated for changes in transmissivity. Surface and subsurface defects on all materials were examined microscopically and, where deemed of note, were documented photographically.

2019 **(SAND—82-1714) Characterizing solar mirror materials using portable reflectometers.** Pettit, R.B. (Sandia National Labs., Albuquerque, NM (USA)). Sep 1982. Contract AC04-76DP00789. 23p. NTIS, PC A02/MF A01. Order Number DE83000804.

Currently available portable instrumentation for hemispherical and specular reflectance measurements of solar mirror materials is discussed. Particular attention is given to the wavelength dependence of the measurement spectrum, which in most cases does not approximate a solar spectral distribution, and to other limitations of each instrument. Because a portable instrument is not available that

can determine the solar averaged specular reflectance from a single measurement, two procedures are recommended for obtaining a reasonable estimate for this quantity using the existing portable equipment. Finally, future developments in this area are briefly discussed.

2020 **(SAND—82-7102) Photovoltaic concentrator with plastic-film reflector. Final report.** (Boeing Engineering and Construction Co., Seattle, WA (USA)). Jun 1982. Contract AC04-76DP00789. 84p. NTIS, PC A05/MF A01. Order Number DE83001715.

Portions of document are illegible.

A 4m diameter reflective film, parabolic dish concentrator proposed for use with a photovoltaic array has been designed, fabricated, and tested. The concentrator is made from aluminized film gores (wedge shaped pieces) that are taped together along their edges to form a dish. The shape of the dish is maintained by a pressure difference between the front and back. The deep dish was designed to illuminate a cylindrical receiver populated by solar cells with a geometric concentration ratio of 145. Three full scale dishes were made in sequence, each using improvements suggested by the previous design. They were tested with a laser to determine surface errors and flux uniformity on the target.

2021 **(SAND—82-7121) Design and development of a laminated glass-plastic Fresnel lens for point focus photovoltaic systems.** Matalon, L.A. (Swedlow, Inc., Garden Grove, CA (USA)). Aug 1982. Contract AC04-76DP00789. 36p. NTIS, PC A03/MF A01. Order Number DE83001007.

The design and development of a laminated glass-plastic Fresnel lens for point focus photovoltaic systems use is described. The objective of this development was to examine the feasibility of producing lenses with a cost effectiveness superior to that of lenses made by casting of acrylic. The procedure used in executing this development, the method used in cost effectiveness evaluation, results obtained and recommendations for further work are presented.

2022 **Thermal and photochemical studies of solar energy absorbers dissolved in heat transfer fluids.** Burke, A.R.; Etter, D.E.; Hudgens, C.R.; Wiedenheft, C.J.; Wittenberg, L.J. (Monsanto Research Corp., Miamisburg, OH). *Solar Energy Materials;* 6: No. 4, 481-490(May-Jun 1982). Contract AC04-76DP00053.

Thermal stability, photochemical stability and optical absorptivity at elevated temperatures of various heat transfer fluids containing chromophoric materials were studied. Eight chromophores, of approximately 20 studied initially, demonstrated short-term photo and thermal stability. Of these eight chromophores, only two did not fully decompose during long-term accelerated thermal stability tests (1000 h at 350°C). Absorptivity and thermal stability data suggest these chromophores may be of value in direct-absorption, solar thermal applications in the mid-temperature range (100 to 300°C).

1420 Heat Storage

2023 **(NP—2904456) Latent heat storage for temperature control in communication satellites.** Leder, E. (Technische Univ. Muenchen (Germany, F.R.). Fakultaet fuer Maschinenwesen). 21 May 1980. 166p. (In German). NTIS (US Sales Only), PC A08/MF A01. Order Number DE82904456.

Thesis.

For powerful communication satellites the application of latent heat storage is investigated that is used for temperature stabilization of the outer walls of the satellite central body. The problem can be reduced to one-dimensional heat conduction processes with a phase change in a plane plate with the assumption that the satellite walls are insulated from each other. For this a power series formulation is used for an approximate solution with radiation into space as a boundary condition. The formulation is used in a thermal model in a linear form that considers the environmental conditions of the satellite in a geo-stationary circular orbit. Hereby the suitability of four phase change media for temperature stabilization is investigated. An optimization of the satellite sizes is performed for a selected phase change medium with respect to a maximum removable leakage power.

15 GEOTHERMAL ENERGY

1501 Resource Status And Assessment

2024 **(DOE/ET/28365—9) Geothermal resource assessment of Ouray, Colorado. Resource series 15.** Zacharakis, T.G.; Ringrose, C.D.; Pearl, R.H. (Colorado Geological Survey, Denver (USA)). 1981. Contract AS07-77ET28365. 76p. NTIS, PC A05/MF A01. Order Number DE83001152.

In 1979, a program was initiated to delineate the geological features controlling the occurrence of geothermal resources in Colorado. In the Ouray area, this effort consisted of geological mapping, soil mercury geochemical surveys and resistivity geophysical surveys. The soil mercury obtained inconclusive results, with the Box Canyon area indicating a few anomalous values, but these values are questionable and probably are due to the hot spring activity and mineralization within the Leadville limestone rock. One isolated locality indicating anomalous values was near the Radium Springs pool and bell park, but this appears to be related to warm waters leaking from a buried pipe or from the Uncompahgre River. The electrical resistivity survey however, indicated several areas of low resistivity zones namely above the Box Canyon area, the power station area and the Wiesbaden Motel area. From these low zones it is surmised that the springs are related to a complex fault system which serves as a conduit for the deep circulation of ground waters through the system.

2025 **(DOE/ET/28365—12-MAP) Revised heat flow map of Colorado.** Zacharakis, T.G. (Colorado Geological Survey, Denver (USA)). 1981. Contract AS07-77ET28365. 12p. NTIS, PC A02/MF A01. Order Number DE83000955.

This present map of Colorado is a revision of the heat flow map published by Pearl and others in 1976. The heat flow values were gathered from previously published reports. The parameters necessary to compute the heat flow values are described. Regionally, Colorado is separated into three heat flow provinces. They are: the Great Plains, the Southern Rocky Mountains, and the Colorado Plateau provinces. The Great Plains province, except for the Raton Basin and Canon City Embayment, indicates normal heat flow. The Southern Rocky Mountain province which encompasses both the Rio Grande Rift and an anomalous zone located near Ouray are the most promising areas for high heat flow. The Colorado Plateau province is considered normal to slightly above normal compared with the regional heat flow of the United States.

2026 **(DOE/ET/28365—13-MAP) Geothermal gradient map of Colorado.** Repplier, F.N.; Fargo, R.L. (Colorado Geological Survey, Denver (USA)). 1981. Contract AS07-77ET28365. 12p. NTIS, PC A02/MF A01. Order Number DE83000954.

Reported bottom hole temperatures (BHT) were taken from 12,000 oil and gas wells provided by the Colorado Oil and Gas Conservation Commission files. Average annual surface temperatures were subtracted from the BHT and then divided by the depth to give a gradient. To eliminate as many sources of error as possible, the gradient values were averaged for each township and contoured.

2027 **(DOE/ET/28365—17) Geothermal resource assessment of Idaho Springs, Colorado. Resource series 16.** Repplier, F.N.; Zacharakis, T.G.; Ringrose, C.D. (Colorado Geological Survey, Denver (USA)). 1982. Contract AS07-77ET28365. 56p. NTIS, PC A04/MF A01. Order Number DE83000345.

Located in the Front Range of the Rocky Mountains approximately 30 miles west of Denver, in the community of Idaho Springs, are a series of thermal springs and wells. The temperature of these waters ranges from a low of 68°F (20°C) to a high of 127°F (53°C). To define the hydrothermal conditions of the Idaho Springs region in 1980, an investigation consisting of electrical geophysical surveys, soil mercury geochemical surveys, and reconnais-

sance geological and hydrogeological investigations was made. Due to topographic and cultural restrictions, the investigation was limited to the immediate area surrounding the thermal springs at the Indian Springs Resort. The bedrock of the region is faulted and fractured metamorphosed Precambrian gneisses and schists, locally intruded by Tertiary age plutons and dikes. The investigation showed that the thermal waters most likely are fault controlled and the thermal area does not have a large areal extent.

2028 **(DOE/ET/28365—18) Geothermal resource assessment of the Animas Valley, Colorado. Resource Series 17.** McCarthy, K.P.; Zacharakis, T.G.; Ringrose, C.D. (Colorado Geological Survey, Denver (USA)). 1982. Contract AS07-77ET28365. 66p. NTIS, PC A04/MF A01. Order Number DE83001151.

The Colorado Geological Survey, has been engaged in assessing the nature and extent of Colorado's geothermal resources. The program has included geologic and hydrogeologic reconnaissance, and geophysical and geochemical surveys. In the Animas Valley, in southwestern Colorado, two groups of thermal springs exist: Pinkerton Springs to the north, and Tripp-Trimble-Stratten Springs about 5 miles (8.1 Km) south of Pinkerton. The geothermal resources of the Animas Valley were studied. Due to terrain problems in the narrow valley, a soil mercury survey was conducted only at Tripp-Trimble Stratten, while an electrical D.C. resistivity survey was limited to the vicinity of Pinkerton. Although higher mercury values tended to be near a previously mapped fault, the small extent of the survey ruled out conclusive results. Consistent low resistivity zones interpreted from the geophysical data were mapped as faults near Pinkerton, and compared well with aerial photo work and spring locations. This new information was added to reconnaissance geology and hydrogeology to provide several clues regarding the geothermal potential of the valley. Hydrothermal minerals found in faults in the study area are very similar to ore mined in a very young mountain range, nearby. Groundwater would not need to circulate very deeply along faults to attain the estimated subsurface temperatures present in the valley. The water chemistry of each area is unique. Although previously incompletely manned, faulting in the area is extensive. The geothermal resources in the Animas Valley are fault controlled. Pinkerton and Tripp-Trimble-Stratten are probably not directly connected systems, but may have the same source at distance. Recharge to the geothermal system comes from the needle and La Plata Mountains, and the latter may also be a heat source. Movement of the thermal water is probably primarily horizontal, via the Leadville Limestone aquifer.

2029 **(DOE/ID/12172—T1) Geothermal resource assessment in Oklahoma.** Prater, M.L.; Cheung, P.K.; Luza, K.V.; Harrison, W.E. (Oklahoma Geological Survey, Norman (USA)). Oct 1981. Contract AS07-80ID12172. 45p. NTIS, PC A04/MF A01. Order Number DE82021288.

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In September 1980, the Oklahoma Geological Survey began a program to assess the geothermal potential of the state. The program, thus far, consists of: (1) the preparation of a detailed geothermal-gradient map of Oklahoma at a scale of 1:500,000; and (2) site-specific investigations of gradient and subsurface conditions in areas that appear to have geothermal potential. Two areas where recent mapping has shown the high gradients (2.1°F/100 feet) were selected for detailed study. These areas are in: (1) Haskell; and (2) Pittsburgh Counties and are subsequently referred to as the Haskell and Pittsburg anomalies. We estimated volume and deliverability of formation water potentially available from several sandstone units for geothermal applications. The Spiro and Cromwell sands were chosen for the Pittsburg anomaly.

2030 **(PB—82-190976) The European HDR case. Where to go next: an assessment of methodology by the working party on hot dry rock research and technology set up by the commission of the european communities.** (Commission of the European Communities, Luxembourg). [nd]. 58p. NTIS PC E04/MF E04.

The hot dry rocks under discussion are hot, dry and impervious base rocks in which a heat carrier fluid could be circulated. The following steps are discussed: Stimulating the rock mass to create a reservoir of sufficient capacity; Circulation of a heat transfer fluid in a closed loop pressurized system at significant mass flow rates; Recovery of the heat availble in commercial quantities over a sufficiently long lifetime.

1502 Geology And Hydrology Of Geothermal Systems

REFER ALSO TO CITATION(S) 1793, 2028

2031 **(DOE/ET/28365—10) Summary of the geology of the San Luis Basin, Colorado-New Mexico with emphasis on the geothermal potential for the Monte Vista Graben. Special Publication 17.** Burroughs, R.L. (Colorado Geological Survey, Denver (USA)). 1981. Contract AS07-77ET28365. 37p. NTIS, PC A03/MF A01. Order Number DE83000953.

The known geologic data of the San Luis Basin are reviewed and related to an understanding of the hydrogeothermal potential of the Alamosa-Monte Vista area. The physiographic setting of the region, the structural framework of the basin, and its influence on the stratigraphic makeup of the rock sequence, which in turn control the occurrence of potential deep water reservoirs, are reviewed. It is suggested that the San Luis Basin was well-developed by Miocene time, and that although the basin was modified by Neogene faulting, it is essentially a late Laramide event having been produced during the Paleogene. Attention is also given to high heat flow along the Rio Grande Rift and to the geothermal gradient of the San Luis Basin. The confined aquifer is then considered in respect to its hydrogeology, water quality, and as to the legal aspects of the system. (LEW)

1503 Geothermal Exploration And Exploration Technology

2032 **(DOE/ET/27034—T2) Geothermal energy resource assessment of parts of Alaska. Final report.** Wescott, E.M.; Turner, D.L.; Kienle, J. (Alaska Univ., Fairbanks (USA)). Aug 1982. Contract FC07-79ET27034. 73p. NTIS, PC A04/MF A01. Order Number DE83000140.

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The central Seward Peninsula was the subject of a geological, geophysical and geochemical reconnaissance survey during a 30-day period in the summer of 1980. The survey was designed to investigate the geothermal energy resource potential of this region of Alaska. A continental rift system model was proposed to explain many of the Late Tertiary-to-Quaternary topographic, structural, volcanic and geothermal features of the region. Geologic evidence for the model includes normal faults, extensive fields of young alkalic basalts, alignment of volcanic vents, graben valleys and other features consistent with a rift system active from late Miocene time to the present. Five traverses crossing segments of the proposed rift system were run to look for evidence of structure and geothermal resources not evident from surface manifestation. Gravity, helium and mercury soil concentrations were measured along the traverses. Seismic, resistivity, and VLF studies are presented.

2033 **(DOE/ET/28365—15) Groundwater temperature map of Colorado.** Repplier, F.N.; Relf, M.M.; Columbia, R.K. (Colorado Geological Survey, Denver (USA)). 1981. Contract AS07-77ET28365. 12p. NTIS, PC A02/MF A01. Order Number DE83000956.

2034 **(PB—82-192394) Investigation of the S. W. England thermal anomaly zone. Final report.** Wheildon, J.; Francis, M.F.; Ellis, J.R.L.; Thomas-Betts, A. (Commission of the European Communities, Luxembourg). 1981. 425p. NTIS PC E14/MF E14.

Twenty three boreholes have been drilled in and around the Cornubian granite batholith in search of potential hot dry rock geothermal resources. Almost as many boreholes drilled by mining companies and the Institute of Geological Sciences have been taken over for heat flow determinations. Temperature logs, thermal conductivity measurements and gamma-ray spectrometric determinations of the radiogenic elements, potassium, uranium and thorium have been made.

2035 **(PB—82-191024) Preliminary guidelines for heat flow density determination.** Balling, N.; Haenel, R.; Ungemach, P.; Vasser, G.; Wheildon, J. (Commission of the European Communities, Luxembourg). [nd]. 38p. NTIS PC E03/MF E03.

Some helpful recommendations for heat flow density determinations from shallow boreholes in geothermal explorations are given, including practical methods for the determination of temperature gradient, thermal conductivity and heat flow density. Proposed guidelines for topographic and paleoclimatic corrections are given, and a worked example for a 190 meter deep borehole demonstrates the method. A standard method for the presentation of heat flow density data is proposed.

2036 **(EUR—7117-IT) Tests on geothermal sources in relation to water flow and their interpretation by mathematical models (prove su geotermici ad acqua dominante e modelli matematici interpretativi).** (Commission of the European Communities, Luxembourg). [nd]. 182p. NTIS PC E08/MF E08.

The report presents the available information on the geothermal source of field Alfina and on the fluid produced from the well Alfina 7, in particular during the last production phase. A model of the geothermal field is presented based on the first production phase and on the physical characteristics of this source. Descriptions of the experiments are presented as well as the problems encountered in the separation of water and vapor and in the scaling of the installation.

2037 **(EUR—7126/1EN) Latera 1 exploratory well, general report.** (Commission of the European Communities, Luxembourg). [nd]. 22p. NTIS PC E02/MF E02.

The choice of the site for Latera 1 was based on the results of a series of geological, geophysical and geochemical surveys. The following favorable conditions were of particular importance: (a) a residual positive gravity anomaly; (b) a structural high of the resistive substratum; (c) the presence nearby of an electric discontinuity that may be indicative of a fault. The drilling down to 2796m and the problems encountered are described. Temperature at depth was 344C. The well was found to be non-commercial due to cementation of the fractures by sulphate and carbonate.

2038 **(EUR—7200-FR) Determination of the distribution of telluric currents in the Rhine graben by means of differential magnetic soundings (determination par sondage magnetique differentiel de la distribution des courants telluriques dans le fosse rhenan, application a la prospection des zones geothermiques).** (Commission of the European Communities, Luxembourg). [nd]. 110p. NTIS PC E05/MF E05.

The purpose of the measurements undertaken by the Centre de Recherches Geophysiques (CRG) was to investigate the relationship between possible anomalies in the variation field pattern and known geothermal anomalies (in particular in the areas of Mulhouse and Pechelbronn). The method known as magnetic differential sounding (MDS), designed by CRG, was used. Three successive field surveys identified an important anomaly of the transient field in Alsace, representing 30% to 40% of the amplitude of the normal field measured at the reference station in the Vosges mountains. The amplitude of the anomaly increases from south of Mulhouse to north of Strasbourg. The final stage of the research work dealt with the study of the properties of the electrical (E) field within the Rhine Graben.

2039 **(EUR—7318-EN) Five-component magneto-telluric survey: Le Mont Dore geothermal area.** (Commission of the European Communities, Luxembourg). [nd]. 202p. NTIS PC E09/MF E09.

The purpose of the operation was to locate, in both depth and horizontal extension, a possible conductive body, using the improved MT 5 expotential method. High conductance in geothermal fields is related to a hot water reservoir. The field operations began on September 15, 1978 and were completed on September 23, 1979. The final scope of the field work comprised a network of 110 recording stations.

2040 **(EUR—7319-DE) Investigation of the thermal area of the Urach district down to medium depth, as well as experiences with geophysical and geochemical methods (erkundung des temperaturfeldes bis in grossere tiefen im bereich von urach sowie erprobung geophysikalischer und geochemischer methoden).** Hanel, R. (Commission of the European Communities, Luxembourg). [nd]. 340p. NTIS PC E12/MF E12.

Four of the seven projects undertaken by the Geothermal Research Project, Urach, produced positive results. These were: (1) the terrestrial heat flux was measured in five 30-40 m deep holes in the Urach anomaly by means of a new method for determining heat conductivity in situ; (2) aeromagnetic studies, comparing measurements with results from several models demonstrated the possibility of the Curie-isotherm rising to a maximum; (3) analysis of seismological signals, resulting from remote and local earthquakes; (4) chemical experiments on minerals and leaching solutions showed that there is a good chance of releasing additional energy.

1505 Economic And Financial Aspects

REFER ALSO TO CITATION(S) 2045, 2046

2041 **(DOE/ID/12018—12) Industrial-market opportunities for geothermal energy in Colorado. Special Publication 20.** Coe, B.A. (Colorado Geological Survey, Denver (USA)). Apr 1982. Contract FC07-79ID12018. 74p. NTIS, PC A04/MF A01. Order Number DE83000957.

Portions of document are illegible.

Geothermal sites in Colorado are listed. The potential industrial market for geothermal energy in Colorado is described for agriculture, manufacturing, and the tourism and travel industry.

1506 Environmental Aspects And Waste Disposal

2042 **(DOE/ET/20279—230) Prototype residential photovoltaic systems: evaluation results.** Nichols, B.E.; Russell, M.C. (Massachusetts Inst. of Tech., Lexington (USA). Lincoln Lab.; Massachusetts Inst. of Tech., Cambridge (USA). Energy Lab.). 1982. Contract AC02-76ET20279. 6p. (CONF-820906—12). NTIS, PC A02/MF A01. Order Number DE83001139.

From 16. IEEE photovoltaics specialists conference; San Diego, CA, USA (28 Sep 1982).

Since 1979 Massachusetts Institute of Technology Lincoln Laboratory has been developing and testing residential-size photovoltaic power systems. Lessons learned from this experience, and performance summaries for the five prototype systems at the Northeast Residential Experiment Station (in Concord, Massachusetts) and the system at the all-electric Carlisle PV house, are given. Results of evaluating five utility-interactive residential-size inverters also are reported.

2043 **(EGG—2215-Vol.2) Raft River monitor well potentiometric head responses and water quality as related to the conceptual ground-water flow system.** Allman, D.W.; Tullis, J.A.; Dolenc, M.R.; Thurow, T.L.; Skiba, P.A. (Idaho National Engineering Lab., Idaho Falls (USA)). Sep 1982. Contract AC07-76ID01570. 87p. NTIS, PC A05/MF A01. Order Number DE83002087.

Ground-water monitoring near the Raft River site was initiated in 1974 by the IDWR. This effort consisted of semiannual chemical sampling of 22 irrigation wells near the Raft River geothermal development area. This program yielded useful baseline chemical data; however, several problems were inherent. For example, access to water pumped from the wells is limited to the irrigation season (April through September). All the wells are not continuously pumped; thus, some wells that are sampled one season cannot be sampled the next. In addition, information on well construction, completion, and production is often unreliable or not available. These data are to be supplemented by establishing a series of monitor wells in the proposed geothermal withdrawal and injection area. These wells were to be located and designed to provide data necessary for evaluating and predicting the impact of geothermal development on the Shallow Aquifer system.

2044 **(PB—82-195934) Feasibility of using geothermal effluents for waterfowl wetlands.** (CH2M, Inc., Portland, OR (USA)). Sep 1981. 236p. NTIS, PC A11/MF A01.

The feasibility of using geothermal effluent water to develop and maintain waterfowl wetlands was evaluated. Idaho, Montana, Nevada, New Mexico, Northern California, Oregon, and Utah were in the study area. Physical and chemical properties of effluent water was described for 206 sites in the seven states. Potentials of the sites for wetlands were evaluated to the extent possible by applying state-of-the-art water quality criteria and considering factors including availability of land for a wetland, land use and typographic suitability for ground water contamination potential, and waterfowl use potential.

1510 Direct Energy Utilization

2045 **(PB—82-183997) Geothermal energy market study on the Atlantic Coastal Plain: Dover Air Force Base geothermal energy evaluation.** (Johns Hopkins Univ., Laurel, MD (USA). Applied Physics Lab.). Dec 1981. 40p. NTIS, PC A03/MF A01.

This report is one of a series of studies that have been made by the Applied Physics Laboratory or its subcontractors to examine the technical and economic feasibility of the utilization of geothermal energy at the request of potential users.

2046 **(PB—82-184003) Geothermal energy market study on the Atlantic Coastal Plain: geothermal community heating for Cape Charles, Virginia.** Leffel, C.S. Jr. (Johns Hopkins Univ., Laurel, MD (USA). Applied Physics Lab.). Oct 1981. 28p. NTIS, PC A03/MF A01.

An economic feasibility study for a geothermal community heating system has been made for the residential heat load of Cape Charles, Virginia using the JHU/APL GRITS Computer Program. The effects of inflation, interest rates, wellhead temperatures, and the addition of reinjection wells are investigated.

2047 **(EUR—7120-FR) Geothermal heating (le chauffage geothermique). Final report.** AureilLe, M. (Commission of the European Communities, Luxembourg). [nd]. 108p. NTIS, PC A05/MF A01.

After a review of the principle behind the computer program used, the main parameters are set out together with the graphs from which a first estimate of the energy balance and the economic return from projects, can be deduced, without recourse to data processing techniques. In these studies, E.D.F. investigated the relation between the parameters affecting the drilling operations (discharge temperaure of the geothermal water) and the thermal distribution network, while O.E.T. was concerned with the influence of the climate and the type of habitation. For central heating, similar studies were conducted with two different schemes of integrated heat pumps. In each case, the parameters applied were related to energy and economic criteria.

17 WIND ENERGY

1701 Availability (climatology)

REFER ALSO TO CITATION(S) 2053

2048 **(PNL—4361) Vertical extrapolations of wind speed.** Doran, J.C.; Buck, J.W.; Heflick, S.K. (Pacific Northwest Lab., Richland, WA (USA)). Sep 1982. Contract AC06-76RL01830. 61p. NTIS, PC A04/MF A01. Order Number DE83000944.

The extrapolation of wind speeds and wind speed distributions from a lower to an upper level is examined, with particular emphasis on the power law approach. While the power laws are useful for representing the behavior of winds under a variety of conditions, they are shown to be inherently incorrect and misleading for extrapolations. The law's apparent simplicity nevertheless makes it attractive for certain purposes, and its performance at a number of windy sites is tested. The principal feature seems to be the large degree of scatter found from site to site, and even at a single site from one time to the next. Part of this is attributable to the effects of stability, as is seen by dividing the data into daytime and nighttime periods, but the scatter is by no means eliminated by this division. The behavior of the power law exponents is poorer still in complex terrain. While some general tendencies of these exponents can be found, their use cannot be recommended for anything more than a preliminary or rough estimate of wind speeds. Extrapolation formulas for Weibull distributions are also tested with the same data base. They are found to work reasonably well in the mean, but the uncertainties present make their use in any particular case somewhat risky. The use of kites to obtain estimates either of wind speed distributions or power law exponent distributions is simulated. As expected, there is a considerable degree of scatter associated with the results, but the use of kites seems to offer some small possibility of improvement compared to results obtained from the simple extrapolation formulas for Weibull distributions.

1705 Environmental Aspects

2049 **(Juel-Spez—100) Implementing agreement for cooperation in the development of large scale wind energy conversion systems.** (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Projektleitung Energieforschung). Feb 1981. 221p. (CONF-8009293—). Fachinformationszentrum Energie, Physik, Mathematik, Karlsruhe, Germany.

From 5. meeting of experts - environmental and safety aspects of the present large scale WECS; Munich, F.R. Germany (25 Sep 1980).

Abstracts of the 5th Meeting of Experts-Environmental and Safety Aspects of the present Large Scale Wind Energy Conversion Systems (WECS) (25-26 Sep 1980, Muenchen) are presented. All 14 papers have been processed separately and entered in the data base.

1706 Wind Energy Engineering

REFER ALSO TO CITATION(S) 2049

2050 **(AD-A—112908/9) Feasibility study on a low power vertical axis wind-powered generator. Technical report.** Crook, W.R.; Puust, T.; Robinson, M.L.; Vencel, L.J. (Advanced Engineering Lab., Adelaide (Australia)). Sep 1980. 108p. NTIS, PC A06/MF A01.

Described are investigations carried out to establish a design concept for a 1 kW wind-powered generator suitable for use as an alternative power source in isolated locations. Design criteria include high power to weight ratio, simplicity of assembly and potential for fixed, mobile or portable applications. The report proposes a suitable configuration using a Darrieus straight blade rotor with a microprocessor based control system and provides information on the power output to be expected in different wind environments.

2051 **(ALO—4272-T1) Design and fabrication of a low-cost Darrieus vertical-axis wind-turbine system. Phase I. Executive summary.** (Aluminum Co. of America, Alcoa Center, PA. Alcoa Labs.). 22 Jun 1979. Contract AC04-78AL04272. 49p. NTIS, PC A03/MF A01. Order Number DE83002853.

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The design work is summarized for a 17 m, 2-blade Darrieus rotor. Emphasis was placed on component cost reduction rather than selection of optimal configuration or operating modes. The turbine's operation and configuration, a performance analysis, and design criteria are given, as well as cost estimates. Supportive material which provides information for system definition and serves as the basis for cost estimates are presented, including structural analysis, drive train, electrical system, foundation, erection, maintenance, and environmental considerations. (LEW)

2052 **(DOE/NASA/20320—41) Theoretical and experimental power from large horizontal-axis wind turbines.** Viterna, L.A.; Janetzke, D.C. (National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center). Sep 1982. Contract AI01-76ET20320. 18p. (NASA-TM—82944). NTIS, PC A02/MF A01. Order Number DE83001099.

A method for calculating the output power from large horizontal-axis wind turbines is presented. Modifications to the airfoil characteristics and the momentum portion of classical blade element-momentum theory are given that improve correlation with measured data. Improvement is particularly evident at low tip speed ratios where aerodynamic stall can occur as the blade experiences high angles of attack. Output power calculated using the modified theory is compared with measured data for several large wind turbines. These wind turbines range in size from the DOE/NASA 100 kW Mod-O (38 m rotor diameter) to the 2000 kW Mod-1 (61 m rotor diameter). The calculated results are in good agreement with measured data from these machines.

2053 **(PNL—4431) Meteorological field measurements at potential and actual wind-turbine sites.** Renne, D.S.; Sandusky, W.F.; Hadley, D.L. (Pacific Northwest Lab., Richland, WA (USA)). Sep 1982. Contract AC06-76RL01830. 70p. NTIS, PC A04/MF A01. Order Number DE83001493.

An overview of experiences gained in a meteorological measurement program conducted at a number of locations around the United States for the purpose of site evaluation for wind energy utilization is provided. The evolution of the measurement program from its inception in 1976 to the present day is discussed. Some of the major accomplishments and areas for improvement are outlined. Some conclusions on research using data from this program are presented.

2054 **(SERI/STR—211-1707) Federal applications for wind energy systems.** Wilson, J.E.; Schreibeis, R.L.; Neal, R.; Berube, N.; Heffner, G.C. (JBF Scientific Corp., Wilmington, MA (USA)). Aug 1982. Contract AC02-77CH00178. 131p. NTIS, PC A07/MF A01. Order Number DE83000306.

The Federal Applications Study performed these functions: surveyed potential applications and sites where wind power could be used by Federal facilities for electricity production, analyzed the current cost-competitiveness of both small and large wind energy conversion systems (WECS) for use by Federal agencies, identified those sites where WECS are currently economically competitive with the marginal costs of new conventional energy sources, identified promising Federal applications for further consideration by the appropriate agency, performed case studies of two sites which are typical of promising Federal applications, and provided planning guidelines for those agencies interested in implementing wind energy programs or systems at their facilities. The overall approach to collecting the data needed for the economic evaluations is described. Categories of data collected are site specific electrical load and wind resource data, and wind system performance data and economic parameters. It is explained how the machine performance and economic evaluations were conducted and how machines were selected. The results of preliminary screening and of the detailed analysis and case studies are reported, and the limitations of the results of the study are discussed. A brief glossary is included. (LEW)

2055 **(SERI/TR—11052-2) Investigation of passive blade cyclic pitch variation using an automatic yaw control system. Final report.** Hohenemser, K.H.; Swift, A.H.P. (Washington Univ. Technology Associates, Inc., St. Louis, MO (USA)). Aug 1982. Contract AC02-77CH00178. 92p. NTIS, PC A05/MF A01. Order Number DE83000651.

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The investigation of passive cyclic pitch variation using an automatic yaw control system made use of the test equipment and of the results of an earlier study. The atmospheric test equipment consisted of a horizontal axis wind turbine with vane controlled upwind two-bladed rotor of 7.6 m (25 ft) diameter having passive cyclic pitch variation. An automatically triggered electric furl actuator prevented over-speeds and over-torques by furling the rotor which means yawing the rotor out of the winds. The atmospheric test equipment was modified to accept two alternative fully automatic yaw or furl control systems. The first system was of the active type and included a hydraulic single acting constant speed governor as it is used for aircraft propeller controls. Upon reaching the rotor speed limit, the governor delivered pressurized oil to a hydraulic furl actuator which then overcame the unfurling spring force and furled the rotor. When the rotor speed fell below the set value, the governor admitted oil flow from the hydraulic actuator into the oil reservoir and the rotor was unfurled by the spring. The second automatic control system was of a purely mechanical passive type. The rotor thrust, which was laterally off-set from the yaw axis, in combination with a yawing component of the rotor torque due to uptilt of the rotor axis overcame at rated power the unfurling spring and furled the rotor. The analytically predicted and experimentally substantiated negative rotor yaw damping would cause excessive furling rates unless allevated by a furl damper. The tests were supported by a specially developed dynamic yawing analysis. Both analysis and tests indicated that the two-bladed passive cyclic pitch wind rotor can be effectively torque or speed limited by rotor yaw control systems which are less costly and more reliable than the conventional blade feathering control systems.

20 ELECTRIC POWER ENGINEERING

2001 Power Plants And Power Generation

REFER ALSO TO CITATION(S) 1541, 1624, 1624, 1858, 2080, 2180, 2348, 2395, 2424, 2495

2056 **(CW-WR—76-020.100A) High-temperature turbine-technology program. Phase II. Technology test and support studies. Topical report. Development of an analytical method to describe and predict particulate deposition on transpiration-air-cooled turbine blades.** (Curtiss-Wright Corp., Wood-Ridge, NJ (USA). Power Systems Div.). Jul 1982. Contract AC01-76ET10348. 49p. (FE—2291-100A). NTIS, PC A03/MF A01. Order Number DE82022201.

This report presents an introduction to the subject of deposition in gas turbines operating on coal-derived fuels. Included are a literature review, examination of the role of electrophoresis on deposition and experimental results of deposition studies conducted in the gas turbine environment. The experimental studies are related to the charge on hot gases (contaminated and non-contaminated) passing through a turbine and deposition measurements on charged, uncharged, transpiration-air-cooled, water-cooled, and uncooled test samples. It is shown that the electrical charge on hot turbine gases is proportional to the quadratic of fluid-particle velocity and directly proportional to particle concentration. The ionic concentration of the gas turbine medium increases with the increase in temperature in the range of 1000°F to 2000°F. The deposition was found to be less for the transpiration-air-cooled test sample (~ 1300°F) and the excessively water-cooled test sample (~ 350°F) than for the uncooled and uncharged test samples. It was also found that, by using the electrostatic means, a potential exists for a reduction in deposition on gas turbine blades operating in a particulate-laden medium.

2057 **(DOE/ET/15234—T1) External combustion steam injected gas turbine. Final report.** (Boyce Engineering International, Inc., Houston, TX (USA)). Jul 1982. Contract AC01-80ET15234. 243p. NTIS, PC A11/MF A01. Order Number DE82019862.

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With the energy crisis faced by the USA, it is imperative that an attempt be made to enable prime movers which have traditionally utilized expensive fuel oil to use less expensive and freely available fuels. With this objective in mind, an external combustion steam injected (ECSI) gas turbine has been designed and developed. The system involves both the fuel flexibility and cogeneration concepts. The major objective of this project was to indicate the technical feasibility of the system as well as to obtain an insight to the problems associated with the system. The basic system involves using a heat exchanger in which the combustor output is used to

heat the air input to the gas turbine and also to produce steam that may be used for steam injection and steam start. Combustion products never enter the gas turbine. Information is included on the cycle analysis of the ECSI system, design concepts for the overall system and for the gas turbine and heat exchanger, instrumentation and control equipment, performance testing and test results. The Externally Fired Steam Injected Turbine has produced 320HP output at overall thermal efficiencies of 30%. The concept is judged to be technically feasible, has fuel flexibility, can be converted to conventional firing, and is usable for the cogeneration of heat and electric power. (LCL)

2058 **(DOE/METC/SP—191) Atmospheric fluidized-bed projects technology overview.** (Department of Energy, Morgantown, WV (USA). Morgantown Energy Technology Center). Apr 1982. 57p. NTIS, PC A04/MF A01. Order Number DE83001256.

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The primary goal of the DOE Atmospheric Fluidized-Bed Combustion (AFBC) program is to develop a comprehensive data base in fluidized-bed combustion that will provide industry, both manufacturers and users, with information to enable them to decrease their use of oil by the substitution of fuels readily available within the US. The objectives of the program include demonstrating process reliability with numerous fuels, developing an operating/maintenance cost data base, and developing the technology in those areas where demonstrations show further work is required. In addition, tests were sponsored in areas where further data are required to verify or expand the existing technology data base. Concepts offering significant improvements to the FBC technology were explored as part of this program. These concepts were studied using the smallest units that will give viable results. The data collected were analyzed, reviewed extensively, and published to permit decisions to be made as to the value of further work. If warranted, the concepts were tested in larger units, which provide operational data to the data base. The total data base is then made available to industry for its use in assessing, applying, and designing AFBC systems. Current program issues include feed systems, heat transfer, material recycling, air distributor grid design, ignition characteristics, output control, particulate emissions, cost, reliability, and fuel flexibility. These issues and the work that has been accomplished at the various DOE-funded facilities are described. Further activities are also discussed. While this report discusses the activities of DOE-sponsored projects in the private sector and other research institutions, it does not purport to cover all AFBC projects and activities that may be underway in the public or private sector.

2059 **(EPRI-CS—2555) Engineering assessment of an advanced pulverized-coal power plant. Final report.** Yasenchak, G.M.; Ladino, R.H.; Waltz, R.; Powers, J.M.; Sloboda, A.T.; Carter, J. (General Electric Co., Schenectady, NY (USA). Large Steam Turbine-Generator Dept.; Stone and Webster Engineering Corp., Boston, MA (USA); Babcock and Wilcox Co., Barberton, OH (USA). Fossil Power Generation Div.). Aug 1982. 345p. NTIS, PC A15/MF A01. Order Number DE83900267.

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Rapidly escalating coal costs and the emergence of more stringent environmental restrictions make the development of low heat rate coal-based power plants increasingly important. The program described here is a study of the potential for improving the thermal performance of conventional pulverized coal (PC) power plants with an objective of making a lower heat rate plant commercially available in the next 5 to 15 years. During the 1960s there were several plants which exhibited annual unit heat rates in the 8500 to 8800 Btu/kWh (8969 to 9284 kJ/kWh) range. However, as a result of (1) penalties associated with environmental control devices, (2) a general degradation in the quality of coal, and (3) an expected increase in nuclear capacity, todays plants have not improved on or even maintained these levels of thermal efficiency. The primary objectives of this study were to identify and quantify areas of potential heat rate improvements for a conventional pulverized coal power plant, and to define the critical research and development necessary to commercialize them. The study shows that a 4500 psig 1050/1075/1100°F (31.0 MPa 566/579/593°C) plant can achieve a unit plant heat rate of 8877 But/kWh (9365 kJ/kWh) as compared with 9352 Btu/kWh (9866 kJ/kWh) for a 3500 psig 1000/1025/1050°F (24.1 MPa 538/552/566°C or 9835 Btu/kWh (10,376 kJ/kWh) for a 2400 psig 1000/1000°F (16.6 MPa 538/538°C). In addition the study shows that the advanced equipment required for the Advanced Plant would require extensive development but could be ready for commercial offering in approximately 15 years. It is anticipated that this Advanced Plant could be as reliable as a current 2400 psig 1000/1000°F (16.6 MPa 538/538°C) unit.

2060 **(GKSS—81/E/36) Investigations of wet steam flow in turbine stages.** Boie, H.; Tornier, W. (GKSS-Forschungszentrum Geesthacht G.m.b.H., Geesthacht-Tesperhude (Germany, F.R.)). 1981. 70p. (In German). Dep. NTIS (US Sales Only), MF A01. Order Number DE82750560.

The main component of the secondary system of a nuclear steam cycle is the wet steam turbine. The wet steam flow leads to additional efficiency losses and to erosive damages of rotor blades. A computer program for the calculation of the moisture distribution and the efficiency losses, resulting from the presence of wetness has been developed. As a result of analytical and experimental investigations it has been shown that formation of dangerous water in turbine stages can be reduced by the design of the blading. The quantity of deposited water on fixed blades is to be influenced by the geometry.

2061 **(NP—2904431) Optimal short-term power plant operation in regard to plant reliability.** Taud, R. (Technische Hochschule Aachen (Germany, F.R.). Fakultaet fuer Elektrotechnik). 18 Dec 1979. 133p. (In German). NTIS (US Sales Only), PC A07/MF A01. Order Number DE82904431.

Thesis.

A technique for short-term power plant operation planning is being developed. It extensively picks up the boundary conditions appearing in combined operation and also performs a reliability-oriented treatment of the reserve stand-by. An analysis of the short-term power-plant operation planning steps that the operation task is mathematically a matter of non-continuous combinatoric problem, that is marked by a multitude of boundary conditions, that have to be considered simultaneously. For a treatment of an optimization problem structured this way, the mathematical method of mixed-even-linear optimization is especially suited. On the basis of this mixed-even linear modelling of the optimal short-term power plant operation planning in regards of the inclusion of probabilistic reserve determination a computer program is developed that applies linear programming in connection with a Branuch- and Bound-search process.

2062 (NRAES—13, pp 137-148) **Use of farm-produced biogas in engines.** Persson, S.; Bartlett, H.D. (Pennsylvania State Univ., University Park). 1981. Northeast Regional Agricultural Engineering Service, Ithaca, NY 14853.

From Methane technology for agriculture conference; Ithaca, NY, USA (17 Mar 1981).

The best use of farm produced biogas is for heating purposes. When a farm cannot use all the biogas effectively, an alternative is to use the biogas in an engine which generates electricity for the farm. Tests made on a spark ignition, a high compression spark ignition, and a dual fuel (biogas-diesel) engine are discussed, in addition to the purification of biogas and the matching of a digester with a properly sized motor generator.

2063 (NRAES—13, pp 164-172) **Experiences with electrical generation from biogas.** Kofoed, E.; Hansen, B. 1981. Northeast Regional Agricultural Engineering Service, Ithaca, NY 14853.

From Methane technology for agriculture conference; Ithaca, NY, USA (17 Mar 1981).

The biogas plant at Assendrup Farm in Denmark supplies both heat and electric power to the farm. The experiences in fine-tuning the dual fuel diesel motor used for power generation are presented, and the factors related to the use of biogas as a motor fuel are discussed, i.e., modification to the engine, compression ratio, oil injection, timing of injection, scale deposits, and temperature.

2064 **(PB—82-188970) Factors affecting boiler efficiency: a literature study.** Venter, J.S.M. (National Timber Research Inst., Pretoria (South Africa)). Nov 1980. 59p. NTIS, PC A04/MF A01.

Literature on the subject of coal-fired boilers was studied with the objective of establishing criteria whereby the efficiency could be improved. Methods of determining boiler efficiency are also given. Improving the standards of boiler control, i.e. by ensuring optimum combustion and following a regular and thorough maintenance program, are the most important single factors by which the efficiency of a boiler can be improved.

2065 **(PB—82-195066) National Thermal Power Corporation - engineering bulletin. Volume I, Numbers 2-3, December 1981, March 1982.** (National Thermal Power Corp. Ltd., New Delhi (India)). Mar 1982. 37p. NTIS, PC A03/MF A01.

The issue contains papers on: Thermal Power Station Layouts; Simulation Concepts and Their Applications; Aerodynamic Study of Singrauli Chimney; Effect of Load Transients on Performance of Boiler Feed Pumps; and The Indeterminates in EP Design. Engineering development activities of NTPC are also given.

2066 **(PB—82-198045) Assessment of high heat-transfer evaporators as power plant condensers to produce abundant freshwater.** Laird, A.D.K.; Frisch, J.; Ensler, E. (California Univ., Berkeley (USA)). 1982. 189p. NTIS, PC A09/MF A01.

Energy requirements to produce abundant freshwater from saline water sources suggests the use of high heat-transfer evaporative condensers in power plants where sufficient waste heat is available for distillation. Review of current existence of such dual-purpose plants as well as a discussion of planning for future designs is presented. Computer programs utilizing available engineering equations and cost analysis for multieffect distillation plants have been developed and are presented with example problems. They are particularly useful for analysis of existing designs, and an additional computer code for optimization of new designs has been developed. The examples show appreciable improvement in lowering unit water cost of the product, as well as adjusting such variables as temperature, mass flow rates and evaporator areas. Preliminary computerized calculations show that a two-effect evaporator unit condensing 7 million pounds per hour of steam from a 1,000 MW power plant would produce 23 million gallons per day of freshwater at a cost of less than $1 per thousand gallons.

2067 **(PB—82-199134) National Thermal Power Corporation - engineering bulletin, Volume I, Number 1, September 1981.** (National Thermal Power Corp. Ltd., New Delhi (India)). Sep 1981. 23p. NTIS, PC A02/MF A01.

The issue contains paper on Thermal Power Station Layouts; Simulation Concepts and Their Applications; An Introduction to NTPC 400KV System Design and Suitability of Toughened Glass Insulators for Use on EHV Lines. At the end engineering activities of NTPC is also given.

2068 **Evaluation of advanced combustors for dry NOx suppression with nitrogen bearing fuels in utility and industrial gas turbines.** Cutrone, M.B.; Hilt, M.B.; Goyal, A.; Ekstedt, E.E.; Notardonato, J. (GE, Schenectady, NY, USA). *Journal of Engineering for Power;* **104**: No. 2, 429-438(Apr 1982).

The work described in this paper is part of the DOE/LeRC Advanced Conversion Technology Project (ACT). The program is a multiple contract effort with funding provided by the Department of Energy, and technical program management provided by NASA LeRC. Combustion tests are in progress to evaluate the potential of seven advanced combustor concepts for achieving low NOx emissions for utility gas turbine engines without the use of water injection. 1 ref.

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REFER ALSO TO CITATION(S) 1565, 1569, 1573, 1578, 1579, 2340, 2767, 2962, 2980, 3029

2069 **(AD-A—113771/0) An 'in-stack' diffusion classifier for aerosol mass distribution measurement. Final report Jun 78-Jun 80.** Lundgren, D.A.; Rangaraj, C.N. (Florida Univ., Gainesville (USA). Dept. of Environmental Engineering). Apr 1981. 36p. NTIS, PC A03/MF A01.

A five-stage, screen-type diffusion classifier was designed and built to make in-situ measurement of submicron aerosols at temperatures and pressures encountered in industrial-type exhaust stacks. Laboratory calibration proceeded satisfactorily and held strong promise of successful field demonstration. However, major problems were encountered in test procedures during both field tests (at the Jacksonville Florida Electric Authority (J.E.A.)) Southside generating Station, Unit 4 (oil-fired boiler) and the Naval Air Rework Facility, Jacksonville, Jet Engine test Cell 11 (J-52 engines). Conditioning of the glass fiber filters to sulfur oxides was not done at the Southside Power Plant - this appears to have been the major problem there. Temperatures of the exhaust stack exceeded 200 C at the Jet Engine Test Cell - consequent weight loss due to grease vaporization appears to have been the problem there.

2070 **(ANL/ECT—13) Control of NO/sub x/ from coal-fired boilers: combustion-modification techniques.** Huang, H.S. (Argonne National Lab., IL (USA)). Oct 1981. Contract W-31-109-ENG-38. 146p. NTIS, PC A07/MF A01. Order Number DE83002344.

Portions of document are illegible.

The effectiveness of commercially available combustion-modification (CM) techniques and prospects for seven advanced CM methods now under development are evaluated in terms of controlling NO/sub x/ emissions in coal-fired boilers. Boiler types considered include single-wall-fired and horizontally opposed wall-fired, tangentially fired, and down-fired boilers; underfed, overfed, and spreader stokers; and cyclone units. Significant variations in NO/sub x/ emissions occur with boiler type, coal type, and firing method. Emission-control performance, cost, and operating characteristics are compared for the applicable CM techniques. This study finds off-stoichiometric, or staged, combustion (OSC) and low-excess-air operation to be the most cost-effective methods for existing units, while OSC and low-NO/sub x/ burners are best for new units. Further research is needed to resolve potential corrosion problems associated with low-NO/sub x/ operations. Advanced burner/boiler designs now under active development could lower NO/sub x/ emissions from coal-fired boilers to about 0.2 lb/10^6 Btu heat input. Present efforts to understand NO formation/destruction mechanisms and their interaction with operating characteristics of these new designs should be accelerated.

2071 **(ANL/FE—82-12) Corrosion studies on construction materials for flue-gas-desulfurization systems.** Maiya, P.S. (Argonne National Lab., IL (USA)). Aug 1982. Contract W-31-109-ENG-38. 37p. NTIS, PC A03/MF A01. Order Number DE83002317.

Several Mo- and Cr-bearing alloys of interest to flue-gas desulfurization (FGD) systems have been examined for corrosion in simulated FGD environments at 85°C. To evaluate the importance of hydrogen and chloride ion concentrations, Type 316L stainless steel was exposed for varying times at different pH levels (0.5 to 3.0) and chloride content (0.03 to 5.0 wt% Cl^-). To determine the effects of pH and composition in acid solution that contains a fixed amount of chloride (~ 0.34 wt% Cl^-), a number of alloys were used in which the composition parameter (defined as the sum of Cr and Mo) varied from 19.5 to 33.5 wt%. In all cases, the general corrosion or dissolution as determined from weight loss measurements (mg mm^{-2}) varied linearly with time. The corrosion rate (mg mm^{-2} h^{-1}) for the alloys decreased with an increase in pH in a consistent manner regardless of the alloy crystal structure. The composition effects on corrosion rate were most significant at pH = 0.5. The dependence of corrosion rate on pH, chloride ion concentration, and alloy composition is discussed in a quantitative manner. The relationships developed from the kinetic data provide

useful guidance in the selection of appropriate alloys for more comprehensive studies under more realistic FGD testing environments that include environmental and stress cycling. Also, the materials evaluation approach adopted in the present study enables predictions of the life of components subjected to different environments and is relevant to alloy development work in progress elsewhere. In addition, testing and evaluation procedures have been developed for two alternative materials, namely, a fiber-reinforced plastic (Atlac 4010-A from ICI Americas, Inc.) and an epoxy coating on mild steel (Markote 300 System from Martek Engineering, Inc.); preliminary results are presented.

2072 **(DOE/FC/10200—T2) Chemical and physical characterization of western low-rank coal-waste materials. Part 1. Byproducts from sodium-based dry-scrubbing systems. Final report.** Thompson, C.M. (Radian Corp., Austin, TX (USA)). Aug 1982. Contract AC18-80FC10200. 186p. NTIS, PC A09/MF A01. Order Number DE83001167.

Portions of document are illegible.

Dry flue gas desulfurization processes have been developed in response to the need for less expensive, more reliable systems. Dry processes of interest for this report are dry injection of sodium salts into the flue gas and use of spray dryers as gas-reagent contacting systems. In both cases a dry product is formed. This volume presents results of physical and chemical tests carried out on five samples of waste materials from dry scrubbing processes. Spent dry sorbents from sodium-based dry scrubbing processes are very soluble in water. In the batch dissolution test employed, nearly half of each sample of spent dry sorbent dissolved. In comparison, solubilities of sludges from calcium-based systems are typically below 10%. Column leaching tests indicate that substantial fractions of the arsenic, molybdenum, selenium, sodium and vanadium present in the solids will dissolve under dynamic leaching conditions. Up to 20% of the arsenic present and 40% of the selenium present were leached under the conditions used. Leachate generated by water coming in contact with wastes can be expected to contain high concentrations of dissolved salts and some trace elements. Leachate of this quality can contaminate high quality surface water or ground water resources if released to them at significant rates (i.e., without controls). Environmentally sound disposal practices for sodium-based spent dry sorbents will require designs that do not permit escape of leachate because leachate quality is so poor. If dry scrubbing processes employing sodium containing sorbents are to be applied widely, a broader range of economically viable disposal options needs to be developed. It should be noted that most commercial spray dryer FGD systems currently being built use lime as the sorbent. Products from these lime-based systems can be expected to have very different disposal characteristics than products from sodium-based systems.

2073 **(NUREG/CR—2529) An integrated regional approach to energy facility siting. Technical report Jul 79-Sep 81.** Kincannon, B.F.; Rutz, W.L. (New England Regional Commission, Boston, MA (USA)). Mar 1982. 254p. NTIS, PC A12/MF A01.

This report summarizes the experience of the six New England States working together on a regional basis to develop a prototype modeling system suitable for assessing environmental and economic issues related to energy facility siting. The modeling system was composed of existing models in three categories; electricity demand forecasting, utility systems planning, and siting/environmental. A number of possible candidate models were used to analyze key energy facility siting issues in New England. The design of the prototype modeling systems is covered in detail dealing with major issues such as model compatibility and linkage, data availability, and operational utility of the system in the analysis of actual policy issues.

2074 **(PB—82-183021) A bibliography of the Maryland power plant siting program, third edition.** Magette, T. (Maryland Dept. of Natural Resources, Annapolis (USA). Power Plant Siting Program). Jan 1982. 59p. NTIS, PC A04/MF A01.

The report contains a bibliography for the power plant siting program. The scope of the Program extends to predicting the impact of proposed new generating facilities, evaluating the acceptability of proposed transmission line routes, assessing the impact of existing generating facilities, acquiring sites for utilities unable to find a suitable site for generation, and investigating numerous information gaps through a long-range research program.

2075 **(PB—82-186537) Environmental assessment: source test and evaluation report - B and W/Alliance atmospheric fluidized-bed combustor. Final report.** Kindya, R.J.; Hall, R.R.; Young, C.W.; Fennelly, P. (GCA Corp., Bedford, MA (USA). GCA Technology Div.). Apr 1981. 112p. NTIS, PC A06/MF A01.

The report gives results of a comprehensive emission sampling and analysis of a pilot-scale, atmospheric-pressure, coal-fired, fluidized-bed combustor (AFBC). Screening data on organic and inorganic pollutants and indications of biological activity were obtained. The Babcock and Wilcox/Electric Power Research Institute AFBC at Alliance, OH. (B and W/EPRI/Alliance), with a coal-firing capacity of 880 kg/hr was tested. Air pollutant emissions of trace elements were measured upstream of particulate controls. Assuming a control efficiency of 99.9%, necessary to meet the utility boiler Federal NSPS for particulate of 13 ng/J, emissions of trace elements are not significant. Elemental concentrations do not appear to be significantly different from other FBCs or conventional coal combustion systems. Limited further analyses for specific polynuclear aromatic compounds indicate that emissions of these compounds are probably of no concern. Analysis of laboratory-generated leachates from solid waste samples reveals that trace metal concentrations are well below Federal hazardous waste criteria. Positive test results for mutagenicity and cytotoxicity screening tests require further investigation.

2076 **(PB—82-192139) Regional and river basin level b studies. Summary report.** (Field (Ralph M.) and Associates, Westport, CT (USA)). 19 Oct 1981. 79p. NTIS, PC A05/MF A01.

This report summarizes Level B activities funded through the Water Resources Council between 1965 and September 1981. During this period Congress appropriated funding for 43 Level B regional studies. The Studies have been used to address water planning issues and needs in nearly every region in the country. River basin commissions have been the principal study sponsors although compact commissions, interagency committees, groups of States and individual States have also participated in the program.

2077 **(PB—82-192980) Water use in Ohio, 1975. Water-resources investigations (final).** Hathaway, R.M.; Eberle, M. (Geological Survey, Columbus, OH (USA). Water Resources Div.). Dec 1981. 50p. NTIS, PC A03/MF A01.

The estimated water use in Ohio for all purposes in 1975 was 16,431 million gallons per day (M gal/d). Of this total, 15,321 M gal/d were taken from surface water while the remaining 1,110 M gal/d represent ground-water withdrawals. Totals by category are as follows (in million gallons per day): Thermoelectric power generation, 12,404; self-supplied industrial use, 2,362; public water supplies, 1,423; rural domestic and livestock, 201; and irrigation, 40. Per capita water use was calculated to be 1,528 gallons per day for an Ohio population of 10,751,000 in 1975.

2078 **(PB—82-195918) Environmental impact statement: Tampa Electric Company, Big Bend Unit 4. Final report.** (Environmental Protection Agency, Atlanta, GA (USA). Region IV). Jan 1982. 466p. NTIS, PC A20/MF A01.

Tampa Electric Company proposes to construct and operate a 417 MW (net) capacity coal-fired electric generating plant at the existing Big Bend complex adjacent to Hillsborough Bay in west-central Hillsborough County, Florida. The Environmental Impact Statement (EIS) examines project alternatives, impacts, and mitigative measures related to groundwater, air, surface water, ecological, and socioeconomic and cultural systems.

2079 **(PB—82-196247) Final environmental impact statement: Dolet Hills Power Plant Project, Northwestern Louisiana.** (Environmental Protection Agency, Dallas, TX (USA). Region VI). Apr 1982. 164p. NTIS, PC A08/MF A01.

The Applicant proposes to construct and operate a 1440 MW Power plant. In association with the plant, a 138 kV transmission line, a makeup water pipeline from Toledo Bend reservoir, a blowdown discharge pipeline to the Red River, and a railroad spur are proposed for construction and operation. The Final Environmental Impact Statement (EIS) documents coordination activities since the Draft EIS was reviewed, and presents revisions to the EIS and project in response to those comments received.

2080 **(PB—82-198763) Chalk Point auxiliary pump study: 1981. Final report.** Hirshfield, M.F.; Hixson, J.H. III; Perry, E.S. (Academy of Natural Sciences of Philadelphia, PA (USA). Div. of Limnology and Ecology). 26 Mar 1982. 61p. NTIS, PC A04/MF A01.

In July 1981, the Academy of Natural Sciences of Philadelphia undertook a study to examine the numbers of finfish and blue crabs (Callinectes sapidus) entrained through the auxiliary cooling pumps at the Chalk Point Steam Electric Station (SES) operated by the Potomac Electric Power Company. Samples were collected by positioning a net attached to a hinged steel frame directly in the discharge of the auxiliary pumps. Concurrently, impingement rates of fish and blue crabs on the travelling screens were estimated by collecting the organisms washed into the troughs that lead to the discharge canal. A total of 6673 fish and blue crabs, representing 13 species, was collected in auxiliary pump samples at the Chalk Point generating station during July and August 1981. A total of 2154 fish and blue crabs representing seven species was collected in concurrent impingement samples. Blue crabs represented almost all of the total. The numbers of individuals entrained through auxiliary pumps showed a diel effect, with most individuals entrained at night.

2081 **(PB—82-212820) Mobilization of heavy metals from fossil-fuelled power plants, potential ecological and biochemical implications. Part 3: heavy metal content in coals burnt in European power plants.** Goetz, L.; Springer, A.; Pietra, R.; Sabbioni, E. (Commission of the European Communities, Ispra (Italy). Joint Research Centre). [nd]. 68p. NTIS PC E05/MF E05.

A series of five reports will assess the environmental risks arising from heavy metals released during the burning of coal by power stations. In this, the third report, the heavy metal content of coals is investigated. The methods used for preparing the coal and fly ash samples for neutron activation analysis are described in detail. Over 30 minerals were detected, their quantity varying according to the origin of the coal. The results of the analyses are presented in a series of tables and compared with values published previously by other authors. It is suggested that a knowledge of the heavy metal content of the stack gases of power stations might form the basis for determining the maximum permissible release rate into the environment and maximum permissible doses for man.

2003 Power Transmission And Distribution

2082 **(CONF-810903—3) Considerations of ac-system impacts when planning hvdc systems.** Long, W.F.; Lasseter, R.H. (Wisconsin Univ., Madison (USA)). 1981. Contract AC02-78ET29185. 8p. D. Order Number DE83001376.

From IEEE/PES conference; Minneapolis, MN, USA (20 Sep 1981).

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High voltage direct current power transmission systems are operational or under construction at twenty-five locations around the world. In addition, a considerable number are now being carefully examined by utility system planners in this country. Applications include the importing of surplus Canadian energy, regional asynchronous interconnections, and increased utilization of available corridor widths. The objective of this paper is to set forth the identification of the effects of a planned dc system on interconnected ac systems located in the general vicinity. Topics include an introduction to the characteristics and equipment of hvdc systems, considerations at the interface between the ac and dc systems, and some ordinary and extraordinary planning considerations. The paper is intended to provide utility transmission and distributin engineers and system planners with an insight into some of the system-related effects of hvdc systems.

2083 **(DOE/ET/29009—1) Design and control of multiterminal HVdc-networks embedded in ac-transmission systems.** (Meisel Energy Systems, Inc., Birmingham, MI (USA)). Sep 1982. Contract AC01-79ET29009. 221p. NTIS, PC A10/MF A01. Order Number DE83000652.

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A separate abstract was prepared for each of the three volumes of this report for the Energy Data Base. (RCK)

2084 (DOE/ET/29009—1, pp I.1-I.63) **Operation and transmission expansion planning of integrated ac-dc power systems.** Gilles, M.L. Sep 1982. NTIS, PC A10/MF A01.

In Design and control of multiterminal HVdc-networks embedded in ac-transmission systems.

Due to added generation and/or customer demand an existing ac-transmission system is found to be deficient. The alleviation of these deficiencies is to be accomplished through the addition of conventional ac-transmission and/or dc-converters and dc-transmission lines. This added equipment is assumed to be available only in specified discrete sizes. In selecting this dc-/ac-equipment a set of equality and inequality constraints need to be incorporated into the formulations. The objective function to be minimized includes a tradeoff between investment costs for new equipment and the cost of operation in terms of overall transmission losses. A list of the features deemed most desirable for this transmission expansion problem are listed below. These features include an exact treatment to the discrete nature of line additions; the use of the complete set of possible network reinforcements; a direct treatment to buses not included in the initial network; the use of cost-capacity curves; the use of an efficient load-flow model; the applicability to large scale networks; and the use of a HVdc-transmission network as a possible reinforcement to the HVac-transmission network.

2085 (DOE/ET/29009—1, pp II.1-II.38) **Steady-state optimal ac-dc system operation.** Prada, R.B.; Cory, B.J. Sep 1982. NTIS, PC A10/MF A01.

In Design and control of multiterminal HVdc-networks embedded in ac-transmission systems.

The optimal operation of an ac-system with an embedded dc-network is discussed. In these considerations, the structure of the combined system is fixed and specified, and a set of contingencies is defined. The designed program seeks an optimal operating state such that a set of equality and inequality constraints are satisfied over normal specifications and also over the complete contingency set. This program is termed a security enhanced optimal power flow program. A sequential ac/dc load-flow method is used with a fast decoupled approach employed for the ac-network. For the dc-network the algorithm can handle contingencies involving the loss of a single-pole line, the loss of bi-pole line, and the loss of two single-pole lines. The complete nonlinear algebraic equations are used together with a nonlinear cost function.

2086 (DOE/ET/29009—1, pp III.1-III.102) **Stability and control of converter stations.** Sucena-Paiva, J.P.; Freris, L.L.; Ferriera de Jesus, J. Sep 1982. NTIS, PC A10/MF A01.

In Design and control of multiterminal HVdc-networks embedded in ac-transmission systems.

An extensive review of the entire program of stability and control of dc-converter stations is presented. The firing control system commonly used in both analog and digital form is presented. Small-signal models of these firing control systems are established. A small-signal analysis of these linear discrete models is reviewed for the case of the converter connected to a strong ac-system and then for the more difficult case of connection to a weak ac-system. For large-signal considerations, the work deals with two approaches. Firstly, an all digital describing-function analysis program has been developed to predict limit-cycles under a variety of conditions. Secondly, the Imperial College dc-simulator is being fitted with converters under microprocessor control. To study the highly non-linear nature of a converter operating under a large signal disturbance, the describing-function method has been employed. The error processing loop of the constant current controller is disconnected and a modulating signal is injected into the firing system unit. A computer program of considerable complexity has been developed to evaluate the describing function (D.F.) through exten-

sive Fourier analysis of both ac- and dc-quantities. The D.F. analysis program includes a steady-state digital simulation for a two-terminal HVdc-system, with the following features: arbitrary imbalance/distortion of ac voltage; firing circuits using independent phase control, pulse frequency control, and pulse phase control; balanced or unbalanced commutating impedances; and infinite or finite short-circuit ratios for the rectifier-side ac system.

2087 **(DOE/ET/29185—21) Assessment of research directions for high-voltage direct-current power systems. Final report.** Long, W.F. (Wisconsin Univ., Madison (USA)). Sep 1982. Contract AC02-78ET29185. 57p. NTIS, PC A04/MF A01. Order Number DE83001118.

High voltage direct current (HVDC) power transmission continues to be an emerging technology nearly thirty years after its introduction into modern power systems. To date its use has been restricted to either specialized applications having identifiable economic advantages (e.g., breakeven distance) or, rarely, applications where decoupling is needed. Only recently have the operational advantages (e.g., power modulation) of HVDC been realized on operating systems. A research project whose objective was to identify hardware developments and, where appropriate, system applications which can exemplify cost and operational advantages of integrated ac/dc power systems is discussed. The three principal tasks undertaken were: assessment of equipment developments; quantification of operational advantages; and interaction with system planners. Interest in HVDC power transmission has increased markedly over the past several years, and many new systems are now being investigated. The dissemination of information about HVDC, including specifically the symposium undertaken for Task 3, is a critical factor in fostering an understanding of this important adjunct to ac power transmission.

2088 **(EPRI-EL—2545) Carrier frequency noise from HVDC converters. Final report.** Fisher, F.A.; Griess, L.D.; LaForest, J.J.; Lindh, C.B. (General Electric Co., Schenectady, NY (USA). Electric Utility Systems Engineering Dept.). Aug 1982. 315p. NTIS, PC A14/MF A01. Order Number DE83900260.

Portions of document are illegible.

This report describes the development of an ac and dc side carrier frequency noise model for incorporation in the Bonneville Power Administration's ElectroMagnetic Transient Program (EMTP). This model of an HVDC Station can generate the characteristic wave shapes of voltages and currents in the time plane on which a Fast Fourier Transformer (FFT) is applied. The model representation of HVDC equipment such as converter transformers, smoothing reactors and harmonic filters is compared with de-energized impedance measurements of similar equipment in an HVDC Station. The carrier frequency range for the model covered is 10 kHz - 300 kHz. Measurements of the noise from an HVDC Station were made using different approaches and instruments. The measurements were obtained on the valve side and line side of the converter for both ac and dc sides. Comparisons between the calculated and measured noise were also made. A section of the report is dedicated to describing measuring methods. In this description, a preferred measurement program is suggested and guidelines are indicated for power line carrier (plc) signal to noise ratios.

2089 **(LA-UR—82-2719) Superconducting magnetic energy storage for BPA transmission-line stabilization.** Rogers, J.D.; Barron, M.H.; Boenig, H.J.; Criscuolo, A.L.; Dean, J.W.; Schermer, R.I. (Los Alamos National Lab., NM (USA)). 1982. Contract W-7405-ENG-36. 4p. (CONF-821108—3). NTIS, PC A02/MF A01. Order Number DE83000640.

From Applied superconductivity conference; Knoxville, TN, USA (30 Nov 1982).

The Bonneville Power Administration (BPA) operates the electrical transmission system that joins the Pacific Northwest with southern California. A 30 MJ (8.4 kWh) Superconducting Magnetic Energy Storage (SMES) unit with a 10 MW converter is being installed at the Tacoma Substation to provide system damping for low frequency oscillations of 0.35 Hz. The integrated system status is described and reviewed. Components included in the system are the superconducting coil, seismically mounted in an epoxy fiberglass nonconducting dewar; a helium refrigerator; a heat rejection subsystem; a high pressure gas recovery subsystem; a liquid nitrogen trailer; the converter with power transformers and switchgear; and a computer system for remote microwave link operation of the SMES unit.

2090 **(NP—2904429) Power distribution and stability control of a high-tension and mixed-current transmission.** Kuehn, W. (Technische Hochschule Aachen (Germany, F.R.). Fakultaet fuer Elektrotechnik). 29 Apr 1980. 148p. (In German). NTIS (US Sales Only), PC A07/MF A01. Order Number DE82904429.

Thesis. Portions of document are illegible.

There are statements made by this work about the possibilities of an operational optimization, a controller with which this optimization is being optimized and about the static and electro-mechanic operational behaviour as well as the stability conditions in controlled operation. With all this, a directed operation control of a HMO-System is made possible. The power distribution factor is in the center. It describes the ratio of direct current power to mixed current power. The characteristic of the distribution factor is used for index value allowance in the following design of a controller. Hereby one reaches an automatized, load-dependent optimization of the efficiency factor and reactive power need. To comment the static and electromechanical stability of a HMO-System, operated by a controller, a real transfer system is simulated on a digital computer. In the treatment of the static stability, both the three-phase current and direct current paths of the HMO are coupled for control via a load-flow program and a simulation program.

2091 **(NP—2904458) Optimal measurement systems for reliable monitoring of electric energy transmission networks.** Bongers, C. (Dortmund Univ. (Germany, F.R.). Lehrstuhl fuer Elektrische Energieversorgung). 19 Oct 1979. 165p. (In German). NTIS (US Sales Only), PC A08/MF A01. Order Number DE82904458.

Thesis.

Starting from theoretical principles of the techniques that are used for estimation of stationary states of electric transmission networks it is shown that by using the Newton-Raphson method, on a pure mathematical sence the solvability of the resulting system of linear equations is connected with conditions, that are identical with the observability of a linear system in stationary respective quasi-stationary state. In this work, however, the concept of observability is used in an extended form, in a way that numerical features, that result from the generally valid properties of electric energy transmission networks, are jointly used with respect to the solvability of the system of equations used. It is derived that the observance of the resulting demands can be recognized in the structure of part of the matrices of the Jacobian H, used in the computation.

2092 **(ORNL/TM—8398) Evaluation of polymers for transformer applications.** McCoy, H.E. Jr. (Oak Ridge National Lab., TN (USA)). Oct 1982. Contract W-7405-ENG-26. 55p. NTIS, PC A04/MF A01. Order Number DE83001717.

Aging studies have been performed on polyethylene terephthalate, polycarbonate, polyparabanic acid, polyethersulfone, and polyimide at 70, 110, 135, and 160°C for times to 4000 h. Several types of tests were run on the aged materials to evaluate changes in mechanical and electrical properties. Polycarbonate showed evidence of degradation after aging at 110°C and higher temperatures, polyethylene terephthalate began to degrade at 135°C, and the other three polymers withstood 160°C without detectable deterioration.

21 NUCLEAR POWER PLANTS

REFER ALSO TO CITATION(S) 1799, 2291, 2395, 2707

2093 **(DOE/ER/04953—T1) Center for Nuclear Studies, Memphis State University. Final report.** (Memphis State Univ., TN (USA). Center for Nuclear Studies). Jul 1979. Contract AS05-76ER04953. 19p. NTIS, PC A02/MF A01. Order Number DE83000949.

Programs developed under technical assistance grants address primarily fundamental training of paraprofessional personnel in the operation of power plants and the radiological safety of employees. As such, the programs will represent an important milestone in the training of power plant personnel. However, programs related to maintenance functions have not been developed. Approximately three times as many technicians perform maintenance functions as those who perform operational functions. These technicians are also drawn from the local area residents and must receive training before assuming jobs in nuclear facilities. Development and implementation of training programs for these maintenance technicians represent the next challenge which must be addressed in the development of an energy manpower pool.

2094 **(INIS-mf—7013) Humaneness of our technical civilization.** Bieri, E. (Gesellschaft fuer Reaktorsicherheit m.b.H. (GRS), Koeln (Germany, F.R.)). 1981. 16p. (In German). (CONF-8110178—5). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82780766.

From 5. GRS-expert's conference on advances in safety evaluation of nuclear power plants; Munich, F.R. Germany (22 Oct 1981).

It is good facing our civilization with a critical distance. It keeps away self-complacency and hybris. What we need is a potential of renewal which must be raised by doubts and challenges. A critical distance is based on the determined approval of our civilization which tries to comply with mankind in a high degree. Civilization is the expression of a realistic picture of man. According to this view freedom shall only be possible because of continuous changes and changes are only possible if there is freedom. Propagating confidence in the undestroyable basic forces of human nature and thus enjoying the present as well as trusting the future: this is our message, our moral task.

2095 (INIS-mf—7041, pp vp) **Nuclear power complex, its integration in CMEA and system of main research trends.** Drahny, M. (Ceskoslovenska Komise pro Atomovou Energii, Prague). 1979. (In Czech). NTIS (US Sales Only), PC A02/MF A01.

From 11. conference on Czechoslovak power specialists; Bratislava, Czechoslovakia (26 Sep 1979).

The concept of the nuclear power complex includes the construction and operation of nuclear power and heat plants, the construction and operation of fuel cycle and waste disposal plants, the metallurgical and engineering base for the production of nuclear power equipment and special construction units for the implementation of nuclear power projects. The nuclear power complex also includes socio-economic aspects and the system of management within the national economy and within international integration. The main trends of development of research for the national nuclear power complex are given. (M.S.).

2096 **(ORAU—205) Manpower requirements in the nuclear power industry, 1982-1991.** Johnson, R.C. (Oak Ridge Associated Universities, Inc., TN (USA)). Sep 1982. Contract AC05-76OR00033. 70p. NTIS, PC A04/MF A01. Order Number DE83000799.

Portions of document are illegible.

The objective of this study is to project occupational employment needs, created by growth and employee turnover, for the nuclear power industry over the next decade. Employment data for 1981 were collected in a survey conducted by the Institute of Nuclear Power Operations of its 60 member utilities. The data were analyzed statistically to identify factors that account for variations in power plant staffing and the number of off-site nuclear support personnel employed by a utility. Total employment in the nuclear power industry is predicted to increase from 54,400 in 1981 to 73,600 in 1991. Nuclear generating capacity will increase from 58 to 124 gigawatts, based on the midline forecast of the Energy Information Administration. The projections assume that current regulations will remain in effect and no new plans for additional generating facilities will be initiated.

2101 Power Reactors, Non-breeding, Light-water Moderated, Boiling Water Cooled

REFER ALSO TO CITATION(S) 2175, 2202, 2236, 2242, 2243, 2260, 2261, 2262, 2263, 2264, 2266, 2267, 2275, 2276, 2277, 2278, 2279, 2292, 2303, 2305, 2313, 2317, 2319, 2322, 2323, 2324, 2325, 2328, 2329, 2331, 2342

2097 **(DOE/ET/34026—5) Sphere-pac fuel development program. Semi-annual progress report, October, 1981-March, 1982.** Kilian, D.C.; Koegler, S.S.; Gerrald, L.D. (Exxon Nuclear Co., Inc., Richland, WA (USA)). Jun 1982. Contract AC06-79ET34026. 59p. NTIS (US Sales Only), PC A04/MF A01. Order Number DE83000258.

Portions of document are illegible.

Progress made by Exxon Nuclear Company, Inc. toward developing processes for fabricating spherical particle (sphere-pac) nuclear fuel is reported for the period October 1981 through March 1982. The objective of the program is to convert a series of batch laboratory operations developed at Oak Ridge National Laboratory into a continuous process suitable for commercial application. The program has moved through the phases of technology review, pilot plant construction, testing of unit operations and equipment development. Equipment designs and process parameters for producing high quality large (1200 μ) and medium (300 μ) size UO_2 spheres with 99% theoretical density have been established. On-going development is directed at optimization of the fine sphere ($< 45\mu$) production techniques and scale-up of prototype process equipment to 100 kg U/day capacity.

2098 **(DOE/ET/34205—33) Final status report in preparation for the chemical cleaning of Dresden-1, DNS-D1-034.** (Dow Chemical Co., Midland, MI (USA). Dow Nuclear Services). Sep 1981. Contract AC02-76ET34205. 607p. NTIS (US Sales Only). Order Number DE83000385.

Portions of document are illegible.

This report discusses the status of all of the activities conducted in preparation for the chemical cleaning of the Dresden-1 Nuclear Power Plant of Commonwealth Edison of Illinois. The metallurgical testing of a solvent and its ability to remove radioactivity are reviewed. Included are all engineering details relating to the modifications to the primary system to be able to perform the chemical cleaning and to rinse the cleaning solvent out of the equipment. A facility to store and process spent cleaning solutions is described in detail. Construction activities and preoperational activities are recounted. Licensing activities, quality assurance, safety, and radiation protection are discussed. The report includes recommendations for future actions for restarting the project when approval is received. All of the efforts discussed in this Final Status Report led to the conclusion that the chemical cleaning, as planned, was feasible. All of the necessary modifications and new equipment are in place and are operational.

2099 **(DOE/ET/34215—25) Out-of-reactor studies on the role of graphite in reducing pellet-cladding interaction susceptibility.** Bunnell, L.R. (Pacific Northwest Lab., Richland, WA (USA)). Aug 1982. Contract AC06-76RL01830. 24p. (PNL—4197). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83000448.

One of the fuel designs under consideration incorporates a thin (~ 6 micron) layer of graphite on the inner surface of zircaloy cladding. The purpose of the graphite is to reduce the mechanical and chemical interaction that might occur between the UO_2 fuel pellets and the cladding. This topical report summarizes out-of-reactor laboratory studies directed at understanding the role graphite plays in reducing PCI susceptibility. A PCI simulator was built that utilized iodine to simulate the corrosive environment in an irradiated fuel rod. The standard cladding used in all FPIP irradiation tests was remarkably failure resistant in the PCI simulator. Other cladding, intentionally selected for its greater failure susceptibility, was used for many of the tests. These tests showed that a graphite coating can improve the failure resistance of susceptible cladding, especially with water vapor present in the test atmosphere. The dominant protection mechanism appears to be physical rather than chemical, by decreasing strain localization through friction reduction.

2100 **(DOE/ET/34215—27) Performance of annular-coated-pressurized, annular-coated, sphere-pac, and reference test rods during steady-state irradiation in HBWR IFA-518.2. Fuel-Performance Improvement Program.** Guenther, R.J.; Barner, J.O. (Pacific Northwest Lab., Richland, WA (USA); Exxon Nuclear Co., Inc., Richland, WA (USA); Consumers Power Co., Jackson, MI (USA)). Sep 1982. Contract AC06-76RL01830;AC02-76ET34215. 171p. (PNL—4224). NTIS (US Sales Only), PC A08/MF A01. Order Number DE83001002.

Portions of document are illegible.

Light-water reactor (LWR) fuel designs with improved resistance to pellet-cladding interaction (PCI) and potentially capable of extended burnup were irradiation-tested as part of the Fuel Performance Improvement Program (FPIP). Three basic designs were represented: (1) an annular-coated-pressurized design (ACP) consisting of annular fuel pellets in pressurized Zircaloy-2 cladding that was coated on the inside surface with a 6-μm layer of graphite, (2) a sphere-pac design (S) containing spherical particles of UO_2 fuel, and (3) a reference design (R) containing standard solid pellets. A variation of the ACP design - an annular-coated design (AC) without pressurization - was also included. This report presents data obtained during the irradiation of these fuel rods in the HBWR from March 1980 to August 1981. Burnups at the end of the irradiation were ~ 10 MWd/kgM in 10 of the fuel rods. Two rods - the annular-coated rod and one reference rod - had been previously irradiated and achieved end-of-life burnups of ~ 16 MWd/kgM during this test. Measured data obtained included cladding axial elongation and rod internal pressure. Analyses of these data in terms of mechanical interaction and fission gas release are presented.

2101 **(DOE/NE—0041) Program summary for the Civilian Reactor Development Program.** (USDOE Assistant Secretary for Nuclear Energy, Washington, DC. Office of the Deputy Assistant Secretary for Nuclear Reactor Programs). Jul 1982. 62p. NTIS, PC A04/MF A01. Order Number DE83001005.

This Civilian Reactor Development Program document has the prime purpose of summarizing the technical programs supported by the FY 1983 budget request. This section provides a statement of the overall program objectives and a general program overview. Section II presents the technical programs in a format intended to show logical technical interrelationships, and does not necessarily follow the structure of the formal budget presentation. Section III presents the technical organization and management structure of the program.

2102 **(EGG-M—03982) Feasibility of on-line fuel-condition monitoring.** Petti, D.A.; Osetek, D.J.; Croucher, D.W.; Hartwell, J.K. (EG and G Idaho, Inc., Idaho Falls (USA)). 1982. Contract AC07-76ID01570. 10p. (CONF-820802—40). NTIS, PC A02/MF A01. Order Number DE83000564.

From International meeting on thermal nuclear reactor safety; Chicago, IL, USA (29 Aug 1982).

The relationship between fuel rod damage and fission product release is investigated to assess the feasibility of using on-line gamma spectroscopy of reactor coolant to estimate not only numbers of detected fuel rods, but also the type of core damage which may occur during an accident or off-normal transient. Fission product release signatures for various fuel conditions and accident scenarios are compared, and unique indicators of fuel damage, ranging from cladding pinholes to severely damaged fuel rods, are suggested, The configuration of monitoring hardware and data analysis soft ware are described, and the benefits, development needs, and usefulness of the envisaged power plant system are discussed.

2103 **(GKSS—81/E/49) Fast burnup routine for 3D reactor simulators.** Krueger, A.; Buenemann, D.; Penndorf, K.; Turgut, M.H. (GKSS-Forschungszentrum Geesthacht G.m.b.H., Geesthacht-Tesperhude (Germany, F.R.). Inst. fuer Physik). 1981. 22p. Dep. NTIS (US Sales Only), MF A01. Order Number DE82750534.

A simple and very fast burnup routine is presented. Starting from composition wise micro burnup calculations (e.g. Programme GELS) a parametrized form of burnup dependent group constants is developed, which allows very fast 3D burnup calculations for light water reactors. Especially it is possible to start dynamic calculations at any burnup situation.

2104 **(PNL-SA—10153) Post-accident containment radiation monitor.** Kenoyer, J.L.; Desrosiers, A.E. (Pacific Northwest Lab., Richland, WA (USA)). Jun 1982. Contract AC06-76RL01830. 20p. (CONF-820655—10). NTIS, PC A02/MF A01. Order Number DE83002042.

From Health Physics Society annual meeting; Las Vegas, NV, USA (27 Jun 1982).

During an emergency at a nuclear power plant, the on-shift staff could be hard-pressed to sample and analyze the containment atmosphere in a timely manner. Under these conditions, the reading of a high-level radiation monitor in the containment could be the basis for evaluating the radiological severity of the accident. The detection system requirements are relatively straightforward. The system must be able to identify the level of airborne radioiodine in the containment. Because it would be located inside the containment structure, the system must require little or no maintenance for long periods of time. Post-accident conditions could be quite severe; the containment radiation monitor must be able to operate in high exposure levels (up to 10^7 R/h), high temperatures (up to 200°C), and extreme pressure and humidity conditions.

2105 **(PNL-SA—10341) Current experience with fuel handling and reconstitution: relationship to rod consolidation.** Bailey, W.J.; Johnson, A.B. Jr. (Pacific Northwest Lab., Richland, WA (USA)). Aug 1982. Contract AC06-76RL01830. 9p. (CONF-820943—4). NTIS, PC A02/MF A01. Order Number DE83002007.

From ANS topical meeting - spent fuel storage; Savannah, GA, USA (26 Sep 1982).

Several thousand BWR and PWR fuel assemblies have been successfully reconstituted. The favorable experience during handling and reconstitution operations involving irradiated fuel should extend to rod consolidation. Though fuel rod consolidation may be more complex operation than fuel assembly reconsitution, the current base of underwater handling experience shows that fuel assembly handling and rod removal can be accomplished without major difficulty or impaired safety for the spent fuel pool operators or the public. The integrity aspects of rod removal include scratches on fuel rod surfaces, rod breakage, and crud effects. The major anticipated effects of consolidation on rod integrity include increased temperature, the formation of crevices, and galvanic effects associated with dissimilar metal contacts.

2106 **(UCID—19468) Processing techniques for data from the Kuosheng Unit 1 shakedown safety-relief-valve tests.** McCauley, E.W.; Rompel, S.L.; Weaver, H.J.; Altenbach, T.J. (Lawrence Livermore National Lab., CA (USA)). Aug 1982. Contract W-7405-ENG-48. 83p. NTIS, PC A05/MF A01. Order Number DE83001726.

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This report describes techniques developed at the Lawrence Livermore National Laobratory, Livermore, CA for processing original data from the Taiwan Power Company's Kuosheng MKIII Unit 1 Safety Relief Valve Shakedown Tests conducted in April/May 1981. The computer codes used, TPSORT, TPPLOT, and TPPSD, form a special evaluation system for treating the data from its original packed binary form to ordered, calibrated ASCII transducer files and then to production of time-history plots, numerical output files, and spectral analyses. Using the data processing techniques described, a convenient means of independently examining and analyzing a unique data base for steam condensation phenomena in the MARKIII wetwell is described. The techniques developed for handling these data are applicable to the treatment of similar, but perhaps differently structured, experiment data sets.

2107 **(EUR—7143-EN) A cross-section sensitivity study for heavy plutonium isotopes and americium isotopes.** Darrouzet, M.; Pinel, J. (Commission of the European Communities, Luxembourg). [nd]. 29p. NTIS PC E03/MF E03.

Under the terms of a contract with the European Community, a sensitivity study about cross-sections of heavy plutonium isotopes and americium isotopes was carried out for PWR and BWR

reactor configurations on the use of recycled plutonium. The main results are presented on the core reactivity balance and activities, neutron emission, and residual power of deactivated spent fuel. With reference to present knowledge, it is thought that the cross-section data require confirmation.

2102 Power Reactors, Non-breeding, Light-water Moderated, Non-boiling Water Cooled

REFER ALSO TO CITATION(S) 2060, 2097, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2107, 2175, 2176, 2177, 2202, 2260, 2261, 2262, 2263, 2265, 2266, 2267, 2268, 2269, 2271, 2273, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2292, 2297, 2298, 2299, 2303, 2304, 2305, 2307, 2310, 2311, 2313, 2314, 2315, 2316, 2317, 2319, 2321, 2322, 2324, 2325, 2328, 2329, 2331, 2342, 2345, 2520, 3511, 3901

2108 **(DOE/ET/34015—1) Steam-generator dilute chemical-cleaning program. Steam-generator chemical-cleaning project. Annual report, program start through 1980.** Schneidmiller, D. (UNC Nuclear Industries, Inc., Richland, WA (USA)). Aug 1982. Contract AC02-79ET34015. 49p. NTIS, PC A03/MF A01. Order Number DE83001708.

Vertical U-tube steam generators in Pressurized Water Reactors (PWRs) operating an All Volatile Treatment (AVT) secondary chemistry have experienced corrosion problems, particularly denting and sludges. The studies reported evaluate the feasibility of using a low-concentration (0.5 wt%) chemical cleaning process to remove corrosion product deposits from steam generator surfaces and magnetite from tube-to-support plate crevices of PWR steam generators. The process potentially may be applied at schedule intervals, such as during normal refueling outages, to maintain a steam generator in clean operating condition. This report describes the results of testing to evaluate the effectiveness of several chelant acids for dissolving steam generator sludges and crevice magnetite. Corrosion of carbon steel by the chelant acids and the effects of various inhibitors are evaluated. The effectiveness of ion-exchange regeneration of several chelant-based solvents is also addressed. 10 figures, 12 tables.

2109 **(DOE/ET/34020—3) Axial blanket fuel design and demonstration. Third progress report, April 1981-March 1982.** Hannah, M.A.; Connell, J.D.; Creasy, J.L.; Hoskins, R.S.; Wampler, T.N. (Babcock and Wilcox Co., Lynchburg, VA (USA)). Jul 1982. Contract AC02-79ET34020. 34p. (BAW—1643-3). NTIS (US Sales Only), PC A03/MF A01. Order Number DE83002159.

The axial blanket fuel design in this program is retrofittable in operating pressurized water reactors and involves replacing the top and bottom of the enriched fuel column with low-enriched (< 1.0 wt % ^{235}U) fertile uranium. This repositioning of the fissile inventory in the fuel rod leads to decreased neutron axial leakage and increased discharge burnups in the enriched fuel. The combination of these two phenomena yields savings in enrichment (separative work requirements), uranium ore, and fuel cycle costs without impacting either fuel performance or plant safety. This report, covering the period from April 1981 through March 1982, is the third progress report for the program. A major milestone was attained in this time frame with the beginning of the irradiation of four axial blanket lead test assemblies in the Rancho Seco cycle 5 core on May 3, 1981.

2110 **(DOE/ET/34212—33) Qualification of the B and W Mark B fuel assembly for high burnup. Seventh semi-annual progress report, July-December 1981.** (Babcock and Wilcox Co., Lynchburg, VA (USA)). May 1982. Contract AC02-78ET34212. 67p. (BAW—1546-7). NTIS (US Sales Only), PC A04/MF A01. Order Number DE83001106.

The extended-burnup performance of Babcock and Wilcox-designed Mark B (15 x 15) pressurized water reactor fuel is being evaluated through irradiations in Duke Power Company's Oconee Unit 1 reactor. This report, covering the period from July through December 1981, is the seventh semi-annual progress report for the program. During this period, a major milestone was achieved - an assembly began its fifth cycle of irradiation in Oconee 1, Cycle 7 (reached initial criticality on December 28, 1981). This fifth cycle will yield an assembly average burnup of more than 50,000 MWd/mtU. Other efforts during this report period included the continuation of hot cell examinations of fuel rods extracted from a 31,000 MWd/mtU, three-cycle assembly and a 40,000 MWd/mtU, four-cycle assembly and the development of a nondestructive eddy-current oxide thickness measurement system. The eddy-current probe design is complete; four probes have been designed, fabricated, and are ready for testing.

2111 **(EGG-M—05582) TMI-2 core examination plan.** Owen, D.E.; MacDonald, P.E.; Hobbins, R.R.; Ploggr, S.A. (EG and G Idaho, Inc., Idaho Falls (USA)). 1982. Contract AC07-76ID01570. 11p. (CONF-820802—39). NTIS, PC A02/MF A01. Order Number DE83000565.

From International meeting on thermal nuclear reactor safety; Chicago, IL, USA (29 Aug 1982).

The Three Mile Island (TMI-2) core examination is divided into four stages: (1) before removing the head; (2) before removing the plenum; (3) during defueling; and (4) offsite examinations. Core examinations recommended during the first three stages are primarily devoted to documenting the post-accident condition of the core. The detailed analysis of core damage structures will be performed during offsite examinations at government and commercial hot cell facilities. The primary objectives of these examinations are to enhance the understanding of the degraded core accident sequence, to develop the technical bases for reactor regulations, and to improve LWR design and operation.

2112 **(EGG-M—10781) Validation of a simple PWR pressurizer model.** Tylee, J.L. (EG and G Idaho, Inc., Idaho Falls (USA)). 1982. Contract AC07-76ID01570. 16p. (CONF-820729—3). NTIS, PC A02/MF A01. Order Number DE83000755.

From Summer computer simulation conference; Denver, CO, USA (19 Jul 1982).

A simple, second-order model of a pressurized water reactor (PWR) pressurizer is developed and evaluated. The model is obtained by assuming the water and steam phases in the pressurizer are in a saturated, homogeneous mixture. Mass and energy balances on this mixture yield the two state equations. The model is validated using actual pressurizer test data.

2113 **(EPRI-NP—2611-Vol.1) Main-coolant-pump shaft-seal reliability investigation. Interim report.** Fair, C.E.; Marsi, J.A.; Greer, A.O. (Borg-Warner Corp., Carson, CA (USA). Byron Jackson Pump Div.). Sep 1982. 55p. NTIS, PC A04/MF A01. Order Number DE83900266.

This report contains the results of a survey of reactor coolant pump shaft seal reliability. The survey sample is representatively large (≈ 27% of total US commercial plant population) and includes the three industry seal suppliers (Bingham-Williamette, Byron Jackson, and Westinghouse). Operationally incurred/induced problems and seal redesign parameters are identified. Failure hypotheses in the form of fault trees have been developed to describe the failure mechanisms. Recommendations are made for seal reliability improvement.

2114 **(GEND-INF—025) Development of a prototype gas sampler for EPICOR II prefilter liners.** Bower, J.M. (EG and G Idaho, Inc., Idaho Falls (USA)). Sep 1982. Contract AC07-76ID01570. 30p. NTIS, PC A03/MF A01. Order Number DE83000758.

Sampling the gas in the EPICOR II prefilter liners will provide data to aid in the development of technology for safely processing highly loaded ion exchange media used to decontaminate water from the TMI-2 Auxiliary and Fuel Handling Buildings. Engineers of EG and G Idaho, Inc., developed special tooling to sample gases from the liners. Operated remotely, the Prototype Gas Sampler removes and reinstalls resin liner vent plugs, and allows for the development of procedures for purging the liners with inert gas while safely handling potentially combustible gases. This report discusses the need for developing the sampler and includes a description of the prototype and its associated systems.

2115 (INIS-mf—7132, pp vp) **Research of testing and control of WWER water regimes.** Rypar, V.; Bartonicek, B.; Erben, O.; Fric, Z.; Masarik, V.; Pelcik, E.; Zajic, V. 1980. (In Czech). NTIS (US Sales Only), PC A09/MF A01.

From Nuclear Research Institute scientific and technical conference; Prague, Czechoslovakia (5 Jun 1980).

Using the RVS-3 water loop described, radiolysis was studied of ammonia aqueous solutions in the presence of boric acid at an ammonium concentration of $(4.5+-0.8)x10^{-3}$ mol/dm^3 and boric acid concentrations of (4.2 to 18.8)$x10^{-3}$ mol/dm^3. The experimental results show that ammonia concentration decreases exponentially with irradiation time and the pH value of the solution thus approaches the steady state value. For monitoring chemical and physico-chemical quantities in the radiation-exposed pressurized water circuit, a high pressure conductometer, a pH meter, a corrosion meter, and a concentration ammeter-type detector were developed. Detector cases were developed for the said devices suitable for working pressure of 20 MPa and a temperature of 350 degC. Neutron and gamma radiations were monitored using beta-emission SPN detectors. Corrosion product separation was achieved using an electromagnetic filter designed for an operating pressure of 19.6 MPa and a temperature of 360 deg at a flow of 3 t/h. (J.B.).

2116 (INIS-mf—7132, pp vp) **Calculations of WWER type light-water lattices.** Lelek, V. 1980. (In Czech). NTIS (US Sales Only), PC A09/MF A01.

From Nuclear Research Institute scientific and technical conference; Prague, Czechoslovakia (5 Jun 1980).

A survey is presented of methodologies and of studies in the field of neutron physics calcualtions of critical assemblies of the WWER 1000 type and their applications in zero power reactors ZR-6 and LR-0, from the compilation of multigroup nuclear data libraries via microcalculations of elementary cells and supercells for macrocalculations. The comparison with experiments proceeds in two planes, viz., the calculations of cells and supercells and detailed macrocalculations. Also included is the compilation of equations on a coarse lattice, homogenization of fuel assemblies and the calculation of boundary conditions. (B.S.).

2117 (INIS-mf—7132, pp vp) **Experimental reactor physics of WWER cores.** Bardos, J.; Osmera, B. 1980. (In Czech). NTIS (US Sales Only), PC A09/MF A01.

From Nuclear Research Institute scientific and technical conference; Prague, Czechoslovakia (5 Jun 1980).

The most important problems are briefly characterized from the field of experimental reactor physics of WWER type reactors, whose solution is being prepared or is proceeding both at the Nuclear Research Institute and in co-operation with other institutions in Czechoslovakia and other CMEA countries. They include the problems of improved operating safety of WWER's, microstructure of power generation, rationalized fuel utilization, radiation damage of the reactor vessel, spatial reactor kinetics, core condition diagnostics. Of experimental facilities, the ZR-6 critical assembly and the LR-0 experimental reactor are available. (B.S.).

2118 (INIS-mf—7132, pp vp) **Spatial distribution of reactor power level and the noise technique of failure identification.** Blazek, J.; Vavrin, J. 1980. (In Czech). NTIS (US Sales Only), PC A09/MF A01.

From Nuclear Research Institute scientific and technical conference; Prague, Czechoslovakia (5 Jun 1980).

A 3-dimensional reactor model is described equipped with various types of detectors for the monitoring, prediction and control of the reactor spatial power distribution. The coherence method is described of the identification of the signal noise model based on the decomposition of signal noise to partial components and the determination of inter-relations with the perturbation system. The possibilities were tested of using the coherence method of identification and good agreement was found of the analytical frequency transfer functions with the identified transfer functions. The coherence method of identification can be applied in investigating mechanical oscillations of reactor core components due to neutron noise, hydrodynamic oscillations and instabilities, local disturbances in heat transfer, local boiling, and global and local neutron power oscillations. (J.B.).

2119 (INIS-mf—7132, pp vp) **Reactor physics and technology.** Hron, M. 1980. (In Czech). NTIS (US Sales Only), PC A09/MF A01.

From Nuclear Research Institute scientific and technical conference; Prague, Czechoslovakia (5 Jun 1980).

The work of the reactor physics department of UJV in the period 1955 to 1980 is assessed and future development is indicated, especially in the field of the preparation and building of the necessary experimental base. In the period 1981 to 1985, research programmes will be focused on experimental research on zero power reactors LR-0 and ZR-6 into the determination of important WWER characteristics, on theoretical calculations associated with the development of the unified complex of proo.rammes for physics calculations of WWER's, on the survey of neutron data from WWER operation, and research into noise diagnostics. (B.S.).

2120 **(INIS-mf—7163) TRANPZ - A computer code for the simulation of reactors with axial dependence.** Sampaio, L.C.M. (Instituto Militar de Engenharia, Rio de Janeiro (Brazil)). Dec 1980. 109p. (In Portuguese). NTIS (US Sales Only), PC A06/MF A01. Order Number DE83780012.

Thesis.

A computer code was developed to simulate a PWR reactor in steady state and during transients. The solution of one speed diffusion equation in the axial direction is obtained numerically dividing the core in various axial segments and the axial power distribution is obtained there from. A method was developed to determine the transient solution. The external reactivity effects are caused by the motion of the control rods, starting from the steady condition with the control rods in any position. The heat conduction equation in the fuel is numerically solved in the radial direction. Various tests were performed in steady state and transient conditions and the validity of the present model was verified. Results were compared in steady state condition with the code CITATION and a reasonable agreement was found. (E.G.).

2121 **(INIS-mf—7166) Iodine filters tests.** Reis, E. (Minas Gerais Univ., Belo Horizonte (Brazil)). Aug 1980. 240p. (In Portuguese). NTIS (US Sales Only), PC A11/MF A01. Order Number DE83780011.

Thesis.

The viability in Brazil of testing nuclear power plants iodine filters as a basis for future works, is discussed. (E.G.).

2122 **(WCAP—8023-Rev.1) Zorita end-of-Cycle-2 on-site examinations: special test-rod data report.** Balfour, M.G.; Guthridge, J.R.; Llewellyn, E.; Smalley, W.R. (Westinghouse Electric Corp., Pittsburgh, PA (USA). Nuclear Energy Systems Div.). Oct 1982. 39p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE83001194.

Fuel examinations were performed at Zorita during the period May 2 through May 22, 1972, using the Mobile Fuel Evaluation System (MFES). A total of 150 fuel rods and 21 dummy rods were removed from test assemblies B-23X, B-24X, C-23X, and C-24X. After the on-site examinations, two new test assemblies, E-22X and E-23X, were reconstituted for Cycle 3 irradiation utilizing 57 of the test rods from Cycle 2. Visual examinations were performed on 114 rods. Nine fuel rods were found defective and another two were suspected to have failed. Profilometry measurements were performed on 36 rods and individual rod length measurements were performed on 41 rods. Crud scraping was performed on 4 fuel rods, and 27 crud samples were obtained. 10 figures, 13 tables.

2123 **(WCAP—8205-Rev.1) Zorita research and development program on special assembly test rods. Semiannual progress report for the period ending June 30, 1973.** Balfour, M.G.; Rim, C.S.; Smalley, W.R.; Metcalf, N.R.; Hott, A.C.; Caye, T.E. (Westinghouse Electric Corp., Pittsburgh, PA (USA). Nuclear Energy Systems Div.). Oct 1982. 47p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE83001235.

This report evaluates the post-irradiation data on fuel rods from the Zorita Special Test Assemblies that have been generated as part of the Research and Development Program. Comparisons

between measured data and design code predictions are made, as well as a comparison of data generated at different sites by different personnel. In addition, an overall judgement of fuel rod behavior is made. 17 figures, 10 tables.

2124 **(WCAP—8272-Rev.1) Zorita research and development program on special assembly test rods. Semiannual progress report for the period ending December 31, 1973.** Balfour, M.G.; Caye, T.E.; Hott, A.C.; Metcalf, N.R. (Westinghouse Electric Corp., Pittsburgh, PA (USA). Nuclear Energy Systems Div.). Oct 1982. 42p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE83001209.

This report evaluates the post-irradiation data on fuel rods from the Zorita Special Test Assemblies that have been generated as part of the Research and Development Program. Comparisons between measured data and design code predictions are made, as well as a comparison of data generated at different sites by different personnel. In addition, an overall judgement of fuel rod behavior is made for those rods for which comprehensive data are available.

2125 **(WCAP—8401-Rev.1) Zorita research and development program on special assembly test rods. Semi-annual progress report for the period ending June 30, 1974.** Balfour, M.G.; Hott, A.C.; Smalley, W.R.; Metcalf, N.R. (Westinghouse Electric Corp., Pittsburgh, PA (USA). Nuclear Energy Systems Div.). Oct 1982. 32p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE83001208.

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This report evaluates the post-irradiation data on fuel rods from the Zorita Special Test Assemblies that have been generated as part of the Research and Development Program. The period from January 1 through June 30, 1974 is covered in this report. Comparisons between measured data and design code predictions are made, as well as a comparison of data generated at different sites by different personnel. In addition, an overall judgement of fuel rod behavior is made for those rods for which comprehensive data are available.

2126 **(WCAP—8411-Rev.1) Zorita fuel rod evaluations.** Balfour, M.G. (Westinghouse Electric Corp., Pittsburgh, PA (USA). Nuclear Energy Systems Div.). Oct 1982. 125p. NTIS (US Sales Only), PC A06/MF A01. Order Number DE83001236.

Fuel/cald interaction during power increases in Cycle 2 has been identified as the most probable failure mechanism in the eleven Cycle 2 test rod failures. Prior clad creepdown and extensive chemical bonding of the fuel to the clad bore were probable contributing factors. The circumstances of the test rod failures suggest a possibility of a clad stress-corrosion cracking mechanism, but direct experimental evidence is lacking. Fuel performance data on the cycle 2 test rods at Windscale have been compiled, including fission gas release, fuel stack length changes, corrosion and hydriding, clad profilometry, and fuel porosity.

2127 **(WCAP—8626) Zorita research and development program on special assembly test rods. Semi-annual progress report for the period ending June 30, 1975.** Balfour, M.G.; Smalley, W.R.; Rim, C.S.; Metcalf, N.R. (Westinghouse Electric Corp., Pittsburgh, PA (USA). Nuclear Energy Systems Div.). Oct 1982. 43p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE83001229.

This report presents and evaluates the post-irradiation data on fuel rods from the Zorita Special Test Assemblies as part of the Research and Development Program. Comparisons between measured data and design code predictions are made, as well as comparisons of data generated at different sites by different personnel. In addition, an overall evaluation of fuel rod behavior is made for those rods for which comprehensive data are available.

2128 **(WCAP—8803-Rev.1) Zorita research and development program on special assembly test rods. Semiannual progress report for the period ending December 31, 1975.** Balfour, M.G.; Smalley, W.R.; Metcalf, N.R. (Westinghouse Electric Corp., Pittsburgh, PA (USA). Nuclear Energy Systems Div.). Oct 1982. 24p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83001191.

This report presents and evaluates the post-irradiation data on fuel rods from the Zorita Special Test Assemblies as part of the Research and Development Program. Comparisons between measured data and design code predictions are made, as well as comparisons of data generated at different sites by different personnel. In addition, an overall evaluation of fuel rod behavior is made for those rods for which comprehensive data are available.

2129 **(WCAP—8959-Rev.1) Zorita Research and Development Program on special assembly test rods. Progress report for the period ending December 31, 1977.** Balfour, M.G.; Smalley, W.R.; Metcalf, N.R.; Melehan, J.B. (Westinghouse Electric Corp., Pittsburgh, PA (USA). Nuclear Energy Systems Div.). Oct 1982. 38p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE83001207.

This report presents and evaluates the post-irradiation data on fuel rods from the Zorita Special Test Assemblies as part of the Research and Development Program. Comparisons between measured data and design code predictions are made, as well as comparisons of data generated at different sites by different personnel. In addition, an overall evaluation of fuel rod behavior is made for those rods for which comprehensive data are available. This report completes the analysis of all hot cell data made available to Westinghouse under the Tripartite R and D Program up to the present time. No new data were received in 1977.

2130 **(WCAP—10172) Zorita end-of-cycle-1 on-site examinations: special test-rod data report.** Caye, T.E.; Smalley, W.R.; Llewellyn, E.; McClintock, D.R. (Westinghouse Electric Corp., Pittsburgh, PA (USA). Nuclear Energy Systems Div.). Oct 1982. 37p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE83001234.

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Fuel examinations were performed at Zorita, Spain, during the period April 26 through May 12, 1971, using the Mobile Fuel Evaluation System (MFES). Experimental assemblies B-24X and C-24X in Cycle No. 1 Core positions B-5 and E-1, respectively, were examined in detail. Visual examinations were performed on the special test assemblies. A total of twenty-two rods (eighteen fuel rods and four dummy rods) were removed from the two test assemblies, and underwater examinations consisting of visual examination, profilometry, length measurements, and crud evaluations were performed. Results of these examinations are summarized.

2131 **(WCAP—10173) Zorita fuel examinations performed during second cycle shutdown.** Llewellyn, E. (Westinghouse Electric Corp., Pittsburgh, PA (USA). Nuclear Energy Systems Div.). Oct 1982. 92p. NTIS (US Sales Only), PC A05/MF A01. Order Number DE83001206.

Fuel examinations were performed at Zorita during the period May 2 through May 22, 1972, using the Mobile Fuel Evaluation System (MFES). A total of 150 fuel rods and 21 dummy rods were removed from test assemblies B-23X, B-24X, C-23X, and C-24X. Visual examinations were performed on 114 of these rods. Ten fuel rods were found defective. Three rods were initially viewed as having possible defects, but later reexamination revealed that these rods were non-defective. Profilometry measurements were performed on 36 rods; high ovality (20 to 30 mils) was evident near the tops of many of the rods. Individual rod length measurements were performed on 41 rods, and significant growth, particularly on the dummy rods, was noted. Reconstitution of two test assemblies, E-22X and E-23X, was completed utilizing 57 of the test rods that were examined. Crud scraping was performed on 4 fuel rods, and 27 crud samples were obtained.

2132 **(WCAP—10174) Zorita end-of-cycle 3 site fuel examinations.** DeStefano, J. (Westinghouse Electric Corp., Pittsburgh, PA (USA). Nuclear Energy Systems Div.). Oct 1982. 82p. NTIS (US Sales Only), PC A05/MF A01. Order Number DE83001231.

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A fuel examination program was performed at the UESA Jose' Cabrera nuclear plant located in Zorita, Spain, during the end-of-cycle 3 refueling outage in October 1973. The program consisted of fuel assembly visual examinations, reconstitution of the

two test assemblies, and test rod withdrawal force measurements, visual examinations, length measurements, profilometry measurements, gamma scanning, eddy current testing, and special handling of crud rods. 20 figures, 18 tables.

2133 **(WCAP—10180-Vol.1) Zorita research and development program. Final report.** Balfour, M.G.; Roberts, E.; DeQuidt, E.; Blanc, P. (Westinghouse Electric Corp., Pittsburgh, PA (USA). Nuclear Energy Systems Div.). Sep 1982. 193p. NTIS (US Sales Only), PC A09/MF A01. Order Number DE83001328.

A summary and evaluation is presented on the performance of Zircaloy-4 clad UO_2 fuel rods operating in special test assemblies in the Zorita reactor for up to five reactor cycles, to average burnups up to 58,200 MWd/MTU. There were two major design variables among the test rods: power level (as a function of fuel enrichment, which varied from 2.4w/o to 6.60w/o U-235) and internal pressurization (air at atmospheric pressure or helium at 500 psia). Comprehensive nondestructive examination were performed on removable test rods during periodic Zorita refueling shutdowns; in addition, selected rods from each of reactor Cycles 1, 2, and 3 were examined destructively at several hot cell laboratories.

2103 Power Reactors, Non-breeding, Graphite Moderated

REFER ALSO TO CITATION(S) 1696, 1697, 1698, 1699, 2101, 2215, 2283, 2284, 2301

2134 **(CONF-820915—5) Core-support performance test in the component-flow test loop.** Sanders, J.P.; Grindell, A.G.; Eatherly, W.P. (Oak Ridge National Lab., TN (USA)). 1982. Contract W-7405-ENG-26. 4p. NTIS, PC A02/MF A01. Order Number DE82022328.

From BNES international conference on gas cooled reactors today; Bristol, UK (20 Sep 1982).

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The CFTL is a closed-circuit, out-of-pile loop circulating helium at temperatures and pressures anticipated in gas-cooled reactors at flows sufficiently large to perform engineering-scale tests. It has the present capability for fast data acquisition and the control and measurement of gaseous impurities, and it has the potential to perform controlled rapid transients in pressure, flow, and power. The initial HTGR component to be tested in the CFTL is the core support structure for the prismatic bed HTGR. This structure has vertical posts mating with post seats, each with spherical curvatures of different radii. At the point of contact, Hertzian stress concentrations are produced. Under the load of the weight of the core plus the pressure gradient, the graphite will deform until the stress is below its yield limit. The Core Support Performance Test (CSPT) will subject this interface, using actual materials and geometry, to impure helium at HTGR operating temperatures, pressures, and flows under a simulated structural load. The concentration of water, hydrogen, and carbon dioxide will be controlled so that six months of test operation will simulate 40 years of reactor operation. The specification of this concentration is based on existing studies involving small graphite samples exposed to a variety of conditions at a few atmospheres. The extrapolation to concentrations that will duplicate both the amount and the nature of the corrosion is based on the oxidation kinetics of the Gadsby equation as parameterized by Velasquez. Ports are provided in the test vessel for in situ inspection of the graphite during the test period. Post-test examination of the structure will be used to correlate its performance with available computational methods.

2135 **(DOE/SF/11440—T2) Helium circulator auxiliary system design analysis. Final report.** (Proto-Power Management Corp., Groton, CT (USA)). Jul 1982. Contract AC03-80SF11440. 32p. NTIS, PC A03/MF A01. Order Number DE82018279.

The report contains the results of the Helium Circulator Auxiliary System Study performed as a part of the High Temperature Reactor Development Program. The major objectives of the study were to review and analyze the existing Fort St. Vrain (FSV) system (System 21) in an effort to identify and recommend modifications which would reduce system interactions, increase system stability, and improve the capability to mitigate system transients. The Helium Circulator Auxiliary System at FSV is comprised of several sub-systems which perform various functions to support the operation of the helium circulators. The primary functions of the system are to provide a source of clean, filtered water for lubrication of the circulator bearings and provide a dry, pressurized buffering gas to the circulator seals. The recommendations contained in this report are aimed at improving performance of the bearing water portion of the system.

2136 **(GA-A—16792) Materials development for HTGR heat exchangers.** Johnson, W.R.; Roberts, D.I. (General Atomic Co., San Diego, CA (USA)). Jul 1982. Contract AT03-76ET35301. 11p. (CONF-821018—3). NTIS, PC A02/MF A01. Order Number DE83000311.

From IEEE/ASME/ASCE joint power generation conference; Denver, CO, USA (17 Oct 1982).

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Some versions of the HTGR generate high primary coolant gas temperatures (850° to 950°C) and exchange this heat, through intermediate heat exchangers (IHX's), to a secondary loop for higher temperature process heat applications. Although IHX's for these systems are typically pressure-balanced (low-stress) units, their design involves several challenges, including the potential interactions between structural materials and impurities present in the HTGR primary coolant. Considerable work is required to qualify materials for IHX applications, including detailed mechanical property characterization, determination of environmental influences on performance, provision of welding materials and procedures for producing joints of adequate strength and integrity, and provisions for wear protection. Some of the work currently under way addressing these issues is described.

2137 (GRS—17(8-80), pp 85-96) **Expert knowledge of persons responsible for the startup of prototype nuclear power plants.** Hantke, H.J.; Daoud, H.; Hendl, H.G.; Bergmann, H.W. Aug 1980. (In German). NTIS (US Sales Only), PC A19/MF A01.

From Symposium on personnel organization and qualification by establishment and operation of nuclear power stations; Koeln, F.R. Germany (10 Jun 1980).

The plant commissioning personnel of prototype nuclear power plants can acquire specific practical know-how only during the commissioning of such plants, since the practical know-how gained with other plants such as test and pilot plants, can be transferred to prototype plants only to a limited degree. In order to obtain sufficient plant-specific know-how before the power test operation is started, the commissioning personnel is being assigned to active participation in various working phases: 1. Planning of commissioning of the systems, zero-energy tests, plant functional tests, and power test operation. 2. Commissioning of system and performance of zero-energy tests. This ensures that the required plant-specific know-how is acquired to the necessary degree before power test operation is started.

2138 **(Juel—1702) Graphitic matrix materials for spherical HTR fuel elements.** Schulze, R.E.; Schulze, H.A. (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Inst. fuer Reaktorwerkstoffe und Heisse Zellen). Feb 1981. 228p. (In German). Dep. NTIS (US Sales Only), MF A01. Order Number DE82750558.

The report comprises the graphical documentation of irradiation results on graphitic matrix materials for spherical HTR fuel elements. The plotted results are based on data analyses of the series of exposures in the High Flux Reactor Petten (HFR). The documentation includes information about the changes of - the dimensions - the dynamic modulus of elasticity - the coefficient of thermal expansion of the materials after irradiation with fast neutrons. The irradiation experiments and the data analyses are part of the matrix development and irradiation programme, whose objective, realization and results obtained are summarized.

2139 **(Juel—1714) Influence of different hydrocarbons and hydrocarbon-mixtures on the pyrocarbon deposition in a fluidized bed.** Abdel-Halim, A.; Gyarmati, E.; Nickel, H. (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Inst. fuer Reaktorwerkstoffe und Heisse Zellen). Apr 1981. 106p. (In German). Dep. NTIS (US Sales Only), MF A01. Order Number DE82750544.

The coating of the fuel particles for the High Temperature Reactor with pyrocarbon takes place in fluidized beds by the pyrolysis of hydrocarbons at high temperatures. The properties of the pyrocarbon layers depend mainly on the deposition temperature, H/C-ration and the net heat of reaction in the fluidized bed. In this report a relation between the mean bed temperature and the reference temperature is determined, which is used to determine the required reference temperature for various H/C-ratios to obtain a constant mean bed temperature. Dependence of the coating results for the three systems C_2H_2-C_3H_8, C_2H_2-CH_4, and C_2H_2-H_2 from the process parameters are determined. With the help of a simple mass balance the results are summarized to a coating-equation , which correlates the parameters of the coating process with the layer data.

2140 **(Juel-Spez—106) Investigations on leak detection in a steam generator based on ultrasound measurements.** Schmidt, K. (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Inst. fuer Reaktorentwicklung). Apr 1981. 42p. (In German). Dep. NTIS (US Sales Only), MF A01. Order Number DE82750189.

In a helium heated steam generator (steam generator of the plant ADAM/EVA II) experiments have been executed with the attempt to detect leakages by ultrasound measurements in shut down periods of the steam generator and under operating conditions. The results of these experiments are reported. The potentials and limitations of a leak detection system based on this method are pointed out.

2141 **Detection and control of as-produced pyrocarbon permeability in biso-coated high temperature gas-cooled reactor fuel particles.** Stinton, D.P.; Thiele, B.A.; Lackey, W.J.; Morgan, C.S. (Oak Ridge Natl Lab, TN, USA). *American Ceramic Society Bulletin;* **61**: No. 2, 245-250(Feb 1982).

Fuel for high temperature gas-cooled reactors consists of dense uranium carbide and thoria microspheres coated with layers of pyrolytic carbon and silicon carbide. The pyrolytic carbon coatings must be impermeable to fission gases to function properly during irradiation. Therefore, particles must be carefully characterized to determine as-produced permeability. The experiment described compares several methods of permeability measurement - long-term chlorination followed by radiography, neon-helium intrusion, and fission gas release - and evaluates their value in predicting irradiation stability. Results show that the long-term chlorination and neon-helium procedures are preferable. 16 refs.

2142 **Materials selection for gas cooled and fusion reactor applications.** Roberts, D.I.; Rosenwasser, S.N.; Watson, J.F. (Gen At Co, San Diego, Calif, USA). *Journal of Materials for Energy Systems;* **3**: No. 2, 54-65(Sep 1981).

This paper is confined to the steels and high temperature alloys used in these systems and how the use of molybdenum enhances properties. 26 refs.

2143 **(EUR—7051-DE) Thermo-and fluid-dynamic analysis of gas-cooled fuel element bundles taking into account thermal conduction and thermal radiation (thermo-und fluid-dynamische alalyse von gasge-kuehlten brennelementbuendeln bei berueksichtigung von waemeleitung und waermestrahlung).** Cevolani, S. (Commission of the European Communities, Luxembourg). [nd]. 202p. NTIS PC E09/MF E09.

A mathematical model was developed to analyse the thermal radiation between the walls and the thermal conduction within pins and the liner of a gas-cooled fuel element bundle. The model was coupled with a flow-model so that all important heat transfer phenomena in the thermo-and fluid-dynamic analysis of the bundle could be considered. In addition, the influence of the wall temperature distribution on flow distribution was taken into account. The model was used to check a number of experiments, performed with various rod-bundles in a wide range of Reynolds numbers (from laminar to turbulent) and under different conditions of heating and with various gases as coolants. The computed results were compared with the measured temperature-and pressure distributions to check the validity of the model and to estimate the relative importance of the different heat transfer mechanisms.

2104 Power Reactors, Non-breeding, Otherwise Moderated Or Unmoderated

REFER ALSO TO CITATION(S) 2285

2144 **(INIS-mf—7132, pp vp) Light water zero power reactor LR-0.** Kadlec, V.; Frystacky, J.; Nemec, V. 1980. (In Czech). NTIS (US Sales Only), PC A09/MF A01.

From Nuclear Research Institute scientific and technical conference; Prague, Czechoslovakia (5 Jun 1980).

The design is described of the LR-0 light water zero power reactor reconstructed from the TR-0 heavy water zero power reactor. A number of components from the original type was used without significant modifications. The control and testing equipment of the LR-0 reactor is also described. (J.B.).

2105 Power Reactors, Breeding

REFER ALSO TO CITATION(S) 1705, 2101, 2137, 2232, 2247, 2248, 2288, 2289, 2302, 2308, 2312, 2326, 2330, 2332, 2333, 2334, 2337, 2574, 2575, 2576

2145 **(RISLEY-Trans—3316) Design and experimental development of intermediate heat exchangers.** Budov, V.M.; Golovko, V.F.; Grdlichko, E.M.; Lukasevich, B.I.; Loginov, S.A.; Savin, N.I. (UKAEA Risley Nuclear Power Development Establishment). [nd]. Translation of IAEA-SM-225/63. (CONF-780407—18-Trans.). 21p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82905458.

From Symposium on design, construction and operating experience of demonstration liquid metal fast breeder reactors; Bologna, Italy (10 Apr 1978).

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A description is given of the design and basic characteristics of BN-350 and BN-600 reactor intermediate heat exchangers. The problems which arise in the designing of heat exchangers and the approach to their solution are discussed. The investigation of thermal, hydrodynamic, and vibration properties in relation to the experimental development of heat exchangers is discussed. 13 figures.

2146 **(RISLEY-Trans—3315) Mathematical and experimental investigations into the physical characteristics of the BN-350 reactor.** Alekhin, L.A.; Zvonarev, A.V.; Ivanov, A.P. (UKAEA Risley Nuclear Power Development Establishment). [nd]. Translation of IAEA-SM-225/62. 22p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82905452.

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The paper gives the main results of investigations into the physics of the BN-350 reactor carried out during the physical and power start up and during the first stage of operation. The critical parameters, effectiveness of the control elements, temperature and power effects of reactivity, reactivity effects due to burnup, distribution in the reactor of the velocities of different reactions and the ratios of mean cross sections of fissile isotopes are discussed. The calculated results were obtained using a variety of methods and computer programmes. It is shown that the use of mathematical approaches developed during the planning of the reactor together with the use of BNAB-70 multigroup constants gives good agreement between calculated and experimental values in the majority of cases.

2147 **(RISLEY-Trans—3321) Safe operation of the BOR-60 development reactor under power station conditions.** Gryazev, V.M.; Antipin, G.K.; Afanas'ev, V.A.; Britov, V.N.; Efimov, V.N.; Kondrat'ev, V.I.; Kon'kov, V.F.; Smirnov, A.M. (UKAEA Risley Nuclear Power Development Establishment). [nd]. Translation of IAEA-SM-225/68. 16p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82905457.

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Using BOR-60 as an example, the characteristic features of the safe operation of a nuclear power station with a BN reactor are analyzed from the point of view of irregularities in the operating conditions of the basic equipment and departures from the engineering parameters. The reactor's self-regulating properties which smooth the transient conditions occurring with perturbations in reactivity, and in sodium flow and reactor inlet temperature are demonstrated. Regulation using neutron flux and using the sodium temperature at the reactor outlet are compared from the point of view of increasing the reliability of the control system and minimizing temperature stresses in elements of the circuit during transient processes. Mathematical and experimental data on the optimization of emergency shut-down conditions of the power station and the shut-down cooling of circuits containing different types of equipment are analyzed. Ways and means are described for monitoring the condition of the vessel, fuel subassemblies, and equipment within the vessel during operation at power and during recharging. Sodium-water steam generator operating experience is analyzed and experience is described of steam generator leak monitoring and safety systems in accidents.

2148 **(ANL—81-4) Development and verification of the LIFE-GCFR computer code for predicting gas-cooled fast-reactor fuel-rod performance.** Hsieh, T.C.; Billone, M.C.; Rest, J. (Argonne National Lab., IL (USA)). Mar 1982. Contract W-31-109-ENG-38. 117p. NTIS, PC A06/MF A01. Order Number DE83000934.

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The fuel-pin modeling code LIFE-GCFR has been developed to predict the thermal, mechanical, and fission-gas behavior of a Gas-Cooled Fast Reactor (GCFR) fuel rod under normal operating conditions. It consists of three major components: thermal, mechanical, and fission-gas analysis. The thermal analysis includes calculations of coolant, cladding, and fuel temperature; fuel densification; pore migration; fuel grain growth; and plenum pressure. Fuel mechanical analysis includes thermal expansion, elasticity, creep, fission-product swelling, hot pressing, cracking, and crack healing of fuel; and thermal expansion, elasticity, creep, and irradiation-induced swelling of cladding. Fission-gas analysis simultaneously treats all major mechanisms thought to influence fission-gas behavior, which include bubble nucleation, resolution, diffusion, migration, and coalescence; temperature and temperature gradients; and fission-gas interaction with structural defects.

2149 **(ANL—82-47) Coupled heat conduction and thermal stress formulation using explicit integration.** Marchertas, A.H.; Kulak, R.F. (Argonne National Lab., IL (USA)). Jun 1982. Contract W-31-109-ENG-38. 31p. NTIS, PC A03/MF A01. Order Number DE83002321.

The formulation needed for the conductance of heat by means of explicit integration is presented. The implementation of these expressions into a transient structural code, which is also based on explicit temporal integration, is described. Comparisons of theoretical results with code predictions are given both for one-dimensional and two-dimensional problems. The coupled thermal and structural solution of a concrete crucible, when subjected to a sudden temperature increase, shows the history of cracking. The extent of cracking is compared with experimental data.

2150 **(CONF-820942—16) Fast reactor short-term fission-product decay heat and its uncertainty.** Peelle, R.W.; Dickens, J.K. (Oak Ridge National Lab., TN (USA)). 1982. Contract W-7405-ENG-26. 12p. NTIS, PC A02/MF A01. Order Number DE82022301.

From Nuclear data for science and technology international conference; Antwerp, Belgium (6 Sep 1982).

Information is presented concerning the 1981 status of fission product decay heat estimates in the USA; new information on fast reactor decay heat; and present consensus on decay heat.

2151 (INIS-mf—7132, pp vp) **Fast reactors.** Zbehlik, J. 1980. (In Czech). NTIS (US Sales Only), PC A09/MF A01.

From Nuclear Research Institute scientific and technical conference; Prague, Czechoslovakia (5 Jun 1980).

Studies are surveyed on the development of fast reactors. They include the problems of reactor core physics, the optimization calculations of the fast reactor and its fuel cycle, selected problems of fast reactor shielding physics, experimental physics problems, the analysis of transient and accident states in the reactor and the primary coolant circuit, the sivificance of hydrodynamics and heat transfer in the core, the building of the SMT-1 sodium testing loop. (J.B.).

2152 (INIS-mf—7132, pp vp) **Modelling of temperature and hydraulic condition of fast reactor fuel assemblies.** Mantlik, F.; Hejna, J.; Sulc, V.; Schmid, J. 1980. (In Czech). NTIS (US Sales Only), PC A09/MF A01.

From Nuclear Research Institute scientific and technical conference; Prague, Czechoslovakia (5 Jun 1980).

The results are summed up and discussed of research into the effect of disturbances of configuration on hydrodynamic and temperature changes in fuel assemblies. The research was performed by the Nuclear Research Institute in co-operation with the Physical Power Institute in Obninsk. The hydrodynamic changes in fuel assemblies were modelled by displacing the central position. Measured were the tangential stress, the velocity field and the turbulent microstructure of flow. Thermal and experimental research was performed using electrically heated models built-in in sodium loops. It included the investigation of the effect of configuration disturbances in the fuel assembly on temperature unevenness along the periphery of the fuel rods cladding. Theoretical calculation work is focused mainly on the compilation of a file of codes for calculating hydrodynamic and temperature condition in fuel assemblies and reactor cores at different configurations and operating conditions (codes CORA, LORAN, NOCA). (H.S.).

2153 (INIS-mf—7132, pp vp) **Analysis of temperature fields and deformations in fast reactor core.** Dienstbier, J. 1980. (In Czech). NTIS (US Sales Only), PC A09/MF A01.

From Nuclear Research Institute scientific and technical conference; Prague, Czechoslovakia (5 Jun 1980).

Deformations of the fuel and breeding assemblies of a sodium cooled fast reactor include swelling of the assembly structural material and radiation creep. The swelling and creep depend on the fast neutron dose and on temperature. Code SANDRA (Structural Analysis of LMFBR Ducts during Reactor Operation) in language PL/I allows modelling long-term reactor operation and predicting deformations and power effects of the core fuel assembly system. The code is a system of independent program units linked with the master program. Code SANDRA joins up to calculations of temperature fields in the reactor using code SUPERED. Two examples are given of calculating deformations of power reactor fuel assemblies. (H.S.).

2154 (INIS-mf—7132, pp vp) **Transients in fast reactor power plant.** Macek, J. 1980. (In Czech). NTIS (US Sales Only), PC A09/MF A01.

From Nuclear Research Institute scientific and technical conference; Prague, Czechoslovakia (5 Jun 1980).

The nuclear reactor, reactor mixing chambers, interconnect pipes, the main circulation pump, intermediate heat exchangers, and steam generators are considered in calculating temperature conditions in nuclear power plant circuits. Mathematical models are presented for the individual components using a system of partial differential equations with initial and boundary conditions, and the calculations of heat transfer coefficients and pressure losses are shown. The mathematical models are associated in a single computer code, DYMO1, for calculating disturbances due to heat removal from the reactor core. (H.S.).

2155 (INIS-SU—109, pp 319-322) **Neutron data, determining errors in the fast reactor specification calculational predictions.** Manturov, G.N.; Nikolaev, M.N. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk. Fiziko-Ehnergeticheskij Inst.). 1980. (In Russian). NTIS (US Sales Only), PC A15/MF A01.

From 5. national Soviet conference on neutron physics; Kiev, Ukrainian SSR (15 Sep 1980).

On the basis of a specified covariance matrix of neutron constant errors estimations of accuracy of calculational predistions of values of the effective multiplication factor and breeding ratio of fast reactor-breeders are obtained. The estimations are performed on the example of a two-dimensional test model of a large plutonium reactor of 1500 MW(e). The conclusion is drawn that the existing data errors on cross sections of ^{238}U inelastic scattering and structural materials in the energy field from the threshold value to some MeV represent a substantial contribution to the effective multiplication factor and breeding ratio error calculation.

2156 (INIS-SU—109, pp 316-318) **Accuracy evaluation of the fast breeder reactor calculational predictions using the ABBN-78 group constant system.** Manturov, G.N.; Nikolaev, M.N. 1980. (In Russian). NTIS (US Sales Only), PC A15/MF A01.

From 5. national Soviet conference on neutron physics; Kiev, Ukrainian SSR (15 Sep 1980).

By the results of 200 integral experiments at fast critical assemblies the algorithmic adjustment of the ABBN-MICRO constant system is performed. It is concluded that the constant system obtained is equivalent on its accuracy to the ABBN-78 system used in design calculations.

2157 **(KFK—3111) History of the Fast Breeder Project.** Marth, W. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Projekt Schneller Brueter). Jul 1981. 285p. (In German). Dep. NTIS (US Sales Only), MF A01. Order Number DE82750187.

The evolution of the Fast Breeder Project from its beginning at the Karlsruhe Nuclear Research Center to the present cooperation of various organisations especially in the Federal Republic of Germany, the Netherlands, Belgium and France is described in its historical context. Where as the emphasis was on physical studies of fast neutron cores in the early phase, technological and safety problems gained importance in the subsequent development. The increasing collaboration with industry and the support by government funds resulted in the design and start of construction of the prototype SNR 300. The objectives and the reasoning underlying important intermediate decisions are described. In the meantime, licensing and funding problems have become decisive for the project schedule. The present report also gives an account of the international and national political aspects which influence the breeder reactor development. In the annex all fast breeder publications of the Karlsruhe Nuclear Research Center are listed.

2158 **(KFK—3254) Pressure drop and heat transfer correlations for use in CFTL bundle analysis.** Hodge, S.A.; Meyer, L. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Neutronenphysik und Reaktortechnik). Dec 1981. 46p. (In German). Dep. NTIS (US Sales Only), MF A01. Order Number DE82750536.

Paper also published as report ORNL/TM--7891 by Oak Ridge National Lab., TN, USA.

The friction factor and Stanton number for flow past a roughened surface are determined by the parameters A and R(h^+) of the universal law of friction and the parameters Asub(H) and G(h^+) of the universal law of heat transfer. The methods used for experimental determination of these parameters for the particular roughness and rod diameter proposed for use in the Core Flow Test Loop (CFTL) are presented and recommended values for use in CFTL bundle flow analysis are prescribed.

2159 **(ORNL—5791) Experimental and calculational analyses of actinide samples irradiated in EBR-II.** Gilai, D.; Williams, M.L.; Cooper, J.H.; Laing, W.R.; Walker, R.L.; Raman, S.; Stelson, P.H. (Oak Ridge National Lab., TN (USA)). Oct 1982. Contract W-7405-ENG-26. 87p. NTIS, PC A05/MF A01. Order Number DE83001719.

Higher actinides influence the characteristics of spent and recycled fuel and dominate the long-term hazards of the reactor waste. Reactor irradiation experiments provide useful benchmarks for testing the evaluated nuclear data for these actinides. During 1967 to 1970, several actinide samples were irradiated in the Idaho EBR-II fast reactor. These samples have now been analyzed, employing mass and alpha spectrometry, to determine the heavy element products. A simple spherical model for the EBR-II core and a recent version of the ORIGEN code with ENDF/B-V data were employed to calculate the exposure products. A detailed comparison between the experimental and calculated results has been made. For samples irradiated at locations near the core center, agreement within 10% was obtained for the major isotopes and their first daughters, and within 20% for the nuclides up the chain. A sensitivity analysis showed that the assumed flux should be increased by 10%.

2160 **(WAPD-TM—1378) Early-in-life performance of short rod duplex pellet screening (D-1) test (AWBA Development Program).** Sphar, C.D.; Sherman, J. (Bettis Atomic Power Lab., Pittsburgh, PA (USA)). Aug 1982. Contract AC11-76PN00014. 165p. NTIS, PC A08/MF A01. Order Number DE83001688.

Portions of document are illegible.

This report evaluates the early-in-life irradiation performance of the D-1 test. The D-1 test is a screening test of the duplex pellet prebreeder reactor fuel concept consisting of a cylindrical thoria pellet surrounded by an annulus containing uranium enriched in uranium-235. The design of the test, which includes duplex pellet annuli of three different compositions (UO_2, UO_2-ZrO_2, and UO_2-ZrO_2-CaO), is described and results of nondestructive and destructive examinations after operation at 13 to 15 kW/ft for 32.6 days are presented. It is concluded that there are no deficiencies in the early-in-life performance of the duplex pellets. The UO_2-ZrO_2 annuli show greater densification than the other two fuel types; however, this does not result in detrimental performance. On the basis of these findings, test irradiation was continued.

2161 **(WAPD-TM—1440) Corrosion and hydriding of irradiated Zircaloy fuel-rod cladding (LWBR Development Program).** Clayton, J.C. (Bettis Atomic Power Lab., Pittsburgh, PA (USA)). Sep 1982. Contract AC11-76PN00014. 54p. NTIS, PC A04/MF A01. Order Number DE83001689.

Zircaloy corrosion performance predicted with the CHORT computer program was compared with measured data from 214 out-of-pile LWBR reference Zircaloy-4 tubing specimens, 47 LWBR irradiation test fuel rods, three MELBA fuel rods, and fuel rod cladding from three commercial pressurized water reactors. CHORT calculations compared well with the out-of-pile autoclave test data, but corrosion thicknesses and hydrogen uptake in LWBR irradiation test program fuel rod cladding were less accurately accounted for by the CHORT program due in part to measurement scatter and material variability. Measured corrosion oxide thicknesses for Maine Yankee, KWO, Turkey Point, and MELBA fuel rods were in reasonable agreement with CHORT predictions.

2162 **(WAPD-TM—1460) Irradiation performance of duplex-fuel-pellet test rods depleted to 9 x 10^{20} fissions/cm^3 of compartment: D-1 test (AWBA development program).** Sphar, C.D.; Mertz, D.A.; Roesener, W.S. (Westinghouse Electric Corp., Pittsburgh, PA (USA). Bettis Atomic Power Div.). Jan 1982. Contract AC11-76PN00014. 189p. NTIS, PC A09/MF A01.

This report evaluates the irradiation performance of the D-1 test. The D-1 test is a screening test of the duplex pellet prebreeder reactor fuel concept consisting of a cylindrical thoria pellet surrounded by an annulus containing urania enriched in uranium-235. The duplex pellet geometry offers the advantage of lower fuel temperatures than solid pellets for equal power output and provides a means of including the fertile material in the fuel rods with little or no loss of heat transfer surface while also providing a practical (chemical) means for separating the uranium-233 bred in the thoria central core without contamination by other uranium isotopes in the annulus. The design of the test, which includes duplex pellet annuli of four different compositions (UO_2, ZrO_2-UO_2, ZrO_2-UO_2-CaO and ThO_2-UO_2) is described, and results of nondestructive ex-

aminations and destructive examinations of selected rods after operation at 9 to 17 kw/ft to peak depletions of 9 x 10^{20} fissions/cm³ (38,000 Mwd/Tonne U + Th) are presented. It is concluded that performance capability of the duplex pellets is excellent. Fuel pellet integrity was well maintained and dimensional changes, fission gas release, and fuel microstructural changes compare favorably with previous solid fuel pellet tests associated with the LWBR development programs. 78 figures, 19 tables.

2163 **(WAPD-TM—1492) Experimental results of the irradiation of long rod duplex pellet screening tests in the NRX reactor (NLDR-1 test) (AWBA Development Program).** Hoffman, R.C.; Yerman, J.F.; Alff, T.H. (Bettis Atomic Power Lab., Pittsburgh, PA (USA)). Jul 1982. Contract AC11-76PN00014. 106p. NTIS, PC A06/MF A01. Order Number DE83001849.

One of the principal areas of investigation in the Advanced Water Breeder Applications (AWBA) program at the Bettis Laboratory is the duplex pellet concept. A duplex pellet consists of a cylindrical ThO_2 central pellet (fertile material) inside an oxide annulus of either UO_2, UO_2-ThO_2, or UO_2-ZrO_2-CaO (fissile material). The NLDR-1 test is one of several screening irradiation tests performed to investigate the behavior of duplex pellets. It consists of two 110-inch long, 0.3 inch diameter, Zircaloy-4 clad rods containing duplex pellets. One rod contained UO_2 annuli. The other rod contained UO_2-ZrO_2-CaO annuli. Both rods were irradiated in pressurized water loops in the NRX reactor to peak depletions of 76,000 MWd/MT U + TH (UO_2 rod) and 120,000 MWd/MT U + Th (UO_2-ZrO_2CaO rod) and average depletions of about 63,000 MWd/MT and about 100,000 MWd/MT, respectively. Peak linear power outputs were 15.3 kW/ft (UO_2 rod) and 13.9 kW/ft (UO_2-ZrO_2-CaO rod). Both rods were periodically removed from the reactor for nondestructive examinations.

2164 **(WAPD-TM—1506) Compaction of AWBA fuel pellets without binders (AWBA Development Program).** Johnson, R.G.R. (Bettis Atomic Power Lab., Pittsburgh, PA (USA)). Aug 1982. Contract AC11-76PN00014. 38p. NTIS, PC A03/MF A01. Order Number DE83001581.

Highly active oxide fuel powders, composed of UO_2, UO_2-ThO_2, or ThO_2, were compacted into ultra-high density pellets without the use of binders. The objective of the study was to select the optimum die lubricant for compacting these powders into pellets in preparation for sintering to densities in excess of 97% Theoretical Density. The results showed that sintered density was a function of both the lubricant bulk density and concentration with the lowest bulk density lubricant giving the highest sintered densities with a lubricant concentration of 0.1 weight percent. Five calcium and zinc stearates were evaluated with a calcium stearate with a 15 lb/ft³ bulk density being the best lubricant.

2165 **(WAPD-TM—1512) Potential of duplex fuel in prebreeder, breeder, and power reactor designs: tests and analyses (AWBA Development Program).** Chao, T.L.; Brennan, J.J.; Duncombe, E.; Schneider, M.J.; Johnson, R.G.R. (Bettis Atomic Power Lab., Pittsburgh, PA (USA)). Sep 1982. Contract AC11-76PN00014. 45p. NTIS, PC A03/MF A01. Order Number DE83001580.

Dual region fuel pellets, called duplex pellets, are comprised of an outer annular region of relatively high uranium fuel enrichment and a center pellet of fertile material with no enrichment. UO_2 and ThO_2 are the fissile and fertile materials of interest. Both prebreeders and breeders are discussed as are the performance advantages of duplex pellets over solid pellets in these two pressurized water reactor types. Advantages of duplex pellets for commercial reactor fuel rods are also discussed. Both irradiation test data and analytical results are used in comparisons. Manufacturing of duplex fuel is discussed.

2166 **(WAPD-TM—1527) ROBOT3: a computer program to calculate the in-pile three-dimensional bowing of cylindrical fuel rods (AWBA Development Program).** Kovscek, S.E.; Martin, S.E. (Bettis Atomic Power Lab., Pittsburgh, PA (USA)). Oct 1982. Contract AC11-76PN00014. 50p. NTIS, PC A03/MF A01. Order Number DE83001582.

ROBOT3 is a FORTRAN computer program which is used in conjunction with the CYGRO5 computer program to calculate the time-dependent inelastic bowing of a fuel rod using an incremental finite element method. The fuel rod is modeled as a viscoelastic beam whose material properties are derived as perturbations of the CYGRO5 axisymmetric model. Fuel rod supports are modeled as displacement, force, or spring-type nodal boundary conditions. The program input is described and a sample problem is given.

2167 **Development of scaling requirements for natural convection liquid-metal fast breeder reactor shutdown heat removal test facilities.** Heisler, M.P. (Rockwell Int, Canoga Park, Calif, USA). *Nuclear Science and Engineering;* **80**: No. 3, 347-359(Mar 1982).

This paper summarizes similitude requirements for liquid-metal fast breeder reactor natural convection shutdown heat removal test facilities. It is generally not possible under natural circulation flow to reproduce both hydrodynamic and thermodynamic similarity when the thermal driving head is determined by structure-to-fluid heat transfer. This paper explores the source of the scaling difficulties and examines a number of possible solutions. Design and operating restrictions imposed on the test facility and the validity of extrapolating test facility data to the full-scale system are discussed. 8 refs.

2107 Regulation And Licensing

REFER ALSO TO CITATION(S) 2204, 2211

2168 **(GRS—17(8-80), pp 3-11) Demands on power plant personnel and personnel organisation from the authorities' point of view.** Pfaffelhuber, J.K. Aug 1980. (In German). NTIS (US Sales Only), PC A19/MF A01.

From Symposium on personnel organization and qualification by establishment and operation of nuclear power stations; Koeln, F.R. Germany (10 Jun 1980).

A survey is given about those essential aspects of qualification and organization of personnel in nuclear power plants, that are already regulated in laws or guidelines. The considerations of the BMI concerning further developments of these requirements are outlined.

2169 **(NUREG—0390-V3-N1) Topical report review status, regulatory activities manpower system.** (Nuclear Regulatory Commission, Washington, DC (USA). Office of Nuclear Reactor Regulation). 15 Jul 1979. 197p. NTIS, PC A09/MF A01.

The purpose of the Nuclear Regulatory Commission (NRC) Topical Report Program is to provide a procedure whereby industry organizations may, upon their own volition or at the request of the NRC staff, submit reports on specific safety related subjects to the NRC and have them reviewed independently of any construction permit or operating license review. The benefits resulting from this program are a minimization of time and effort required of both industry and the NRC on subjects repeated in numerous licensing actions. The safety related subject addressed in a topical report should be applicable to a number of facilities licensed for operation or construction, or to a number of current or anticipated applications for construction permits or standardized reference design approvals.

2170 **(NUREG—0390-V4-N2) Topical report review status, regulatory activities manpower system.** (Nuclear Regulatory Commission, Washington, DC (USA). Office of Nuclear Reactor Regulation). 15 Jul 1980. 212p. NTIS, PC A10/MF A01.

The purpose of the Program is to provide a procedure whereby industry organizations may, upon their own volition or at the request of the NRC staff, submit reports on specific safety related subjects to the NRC and have them reviewed independently of any construction permit or operating license review. The benefits resulting from this program are a minimization of time and effort required of both industry and the NRC on subjects repeated in numerous licensing actions. The safety related subject addressed in a topical report should be applicable to a number of facilities licensed

for operation or construction, or to a number of current or anticipated applications for construction permits or standardized reference design approvals.

2171 **(NUREG—0566-V2-N2) Standards Development Status Summary Report. Quarterly report.** (Nuclear Regulatory Commission, Washington, DC (USA)). Apr 1982. 209p. NTIS, PC A10/MF A01.

The Standards Development Status Summary Report is designed for scheduling, monitoring, and controlling the process by which Regulatory Standards, Guides, Reports, Petitions, and Environmental Statements are written. It is a summary of the current schedule plans for development of the above products.

2172 **(NUREG—0750-V13-N1) Nuclear Regulatory Commission Issuances, January 1981.** (Nuclear Regulatory Commission, Washington, DC (USA)). 1981. 76p. NTIS, PC A05/MF A01.

This report includes the issuances received during the specified period from the Commission (CLI), the Atomic Safety and Licensing Appeal Boards (ALAB), the Atomic Safety and Licensing Boards (LBP), the Administrative Law Judge (ALJ), the Directors Denial (DD), and the Denial of Petition for Rulemaking.

2173 **(NUREG—0845) Agency procedures for the NRC incident response plan: for interim use and comment.** (Nuclear Regulatory Commission, Washington, DC (USA)). Mar 1982. 199p. NTIS, PC A09/MF A01.

The NRC Incident Response Plan describes the functions of the NRC during an incident and the kinds of actions that comprise an NRC response. The NRC response plan will be activated in accordance with threshhold criteria described in the plan for incidents occurring at nuclear reactors, fuel facilities and materials licensees, during transportation of licensed material, and for threats against facilities or licensed material. In contrast to the general overview provided by the Plan, the purpose of these agency procedures is to delineate: (1) The manner in which each planned response function is performed; (2) The criteria for making those response decisions which can be preplanned; (3) The information and other resources needed during a response.

2174 **(PNL-SA—10369) Decommissioning reference nuclear research and test reactors.** Konzek, G.J. (Pacific Northwest Lab., Richland, WA (USA)). Oct 1982. Contract AC06-76RL01830. 15p. (CONF-821005—12). NTIS, PC A02/MF A01. Order Number DE83002052.

From DOE international decommissioning symposium; Seattle, WA, USA (10 Oct 1982).

Safety and cost information is developed for the conceptual decommissioning of two representative licensed nuclear research and test (R and T) reactors. Three decommissioning alternatives [DECON (immediate decontamination), SAFSTOR (safe storage followed by deferred decontamination), and ENTOMB (entombment)] are studied to compare the costs (in 1981 dollars), occupational radiation doses, potential radiation dose to the public, and other safety impacts of implementing each of the alternatives.

2175 **(PNL-SA—10370) Decommissioning of multiple-reactor stations: facilitation by sequential decommissioning.** Moore, E.B.; Smith, R.I.; Wittenbrock, N.G. (Pacific Northwest Lab., Richland, WA (USA)). Oct 1982. Contract AC06-76RL01830. 7p. (CONF-821005—14). NTIS, PC A02/MF A01. Order Number DE83002050.

From DOE international decommissioning symposium; Seattle, WA, USA (10 Oct 1982).

Reductions in cost and radiation dose can be achieved for decommissionings at multiple reactor stations because of factors not necessarily present at a single reactor station: reactors of similar design, the opportunity for sequential decommissioning, a site dedicated to nuclear power generation, and the option of either interim or permanent low-level radioactive waste storage facilities onsite. The cost and radiation dose reductions occur because comprehensive decommissioning planning need only be done once, because the labor force is stable and need only be trained once, because there is less handling of radioactive wastes, and because central stores, equipment, and facilities may be used. The cost and radiation dose reductions are sensitive to the number and types of reactors on the site, and to the alternatives selected for decommissioning.

2176 **(PNL-SA—10371) Post-accident cleanup and decommissioning of a reference pressurized-water reactor.** Murphy, E.S.; Holter, G.M. (Pacific Northwest Lab., Richland, WA (USA)). Oct 1982. Contract AC06-76RL01830. 17p. (CONF-821005—16). NTIS, PC A02/MF A01. Order Number DE83002070.

From DOE international decommissioning symposium; Seattle, WA, USA (10 Oct 1982).

Portions of document are illegible.

This paper summarizes the results of a conceptual study to evaluate the technical requirements, costs, and safety impacts of the cleanup and decommissioning of a large pressurized water reactor (PWR) involved in an accident. The costs and occupational doses for post-accident cleanup and dcommissioning are estimated to be substantially higher than those for decommissioning following the orderly shutdown of a reactor. A major factor in these cost and occupational dose increases is the high radiation environment that exists in the containment building following an accident which restricts worker access and increases the difficulty of performing certain tasks. Other factors which influence accident cleanup and decommissioning costs are requirements for the design and construction of special tools and equipment, increased requirements for regulatory approvals, and special waste management needs. Radiation doses to the public from routine accident cleanup and decommissioning operations are estimated to be below permissible radiation dose levels in unrestricted areas and within the range of annual doses from normal background.

2177 **(UCID—19114-Rev.1) Technical evaluation report on the adequacy of station electric-distribution-system voltages for the Davis-Besse Nuclear Power Station, Unit No. 1 (Revision 1).** White, R.L. (Lawrence Livermore National Lab., CA (USA)). 27 Sep 1982. Contract W-7405-ENG-48. 14p. NTIS, PC A02/MF A01. Order Number DE83000893.

This report documents the technical evaluation of the adequacy of the station electric distribution system voltages for the Davis-Besse Nuclear Power Station, Unit No. 1. The evaluation is to determine if the onsite distribution system in conjunction with the offsite power sources has sufficient capacity to automatically start and operate all Class 1E loads within the equipment voltage ratings under certain conditions established by the Nuclear Regulatory Commission. The analyses submitted indicate that the capacity is sufficient to meet the NRC requirements upon completion of the modifications proposed by the Licensee.

2178 **(NE-M—7-6T-Rev.-9-82) Precipitation-hardening stainless steel bars, shapes, and forgings (ASME SA-564 with additional requirements).** (Department of Energy, Washington, DC (USA). Office of Nuclear Energy Programs). Sep 1982. 13p. Nuclear Standards Management Center, Oak Ridge, TN.

This standard covers precipitation-hardening stainless steel bars, shapes, and forgings for nuclear and associated applications. Material shall conform to the requirements of ASME SA-564; to requirements of the ASME Boiler and Pressure Vessel Code (ASME Code), Section III, Article NB-2000; and to the additional requirements of this standard.

2179 **(NE-F—9-4T-Rev.-9-82) Requirements for construction of Class 1 elevated temperature nuclear system components (supplement to ASME code cases N-47, N-48, N-49, N-50, and N-51).** (Department of Energy, Washington, DC (USA). Office of Nuclear Energy Programs). Sep 1982. 21p. Nuclear Standards Management Center, Oak Ridge, TN 37830.

This standard provides rules for the construction of Class 1 nuclear components, parts, and appurtenances for use at elevated temperatures. This standard is a complete set of requirements only when used in conjunction with Section III of the ASME Boiler and Pressure Vessel Code (ASME Code) and addenda, ASME Code Cases N-47, N-48, N-49, N-50, and N-51, and NE E 15-2NB-T. Un-

modified paragraphs of the referenced Code Cases are not repeated in this standard but are a part of the requirements of this standard.

2108 Economics

REFER ALSO TO CITATION(S) 2168, 2220, 2237, 3417

2180 **(DOE/NE—0044-Ver.1) Nuclear energy cost data base. A reference data base for nuclear and coal-fired power-plant power-generation cost analysis.** (USDOE Assistant Secretary for Nuclear Energy, Washington, DC. Office of Resource Management and Planning). Oct 1982. 107p. NTIS, PC A06/MF A01. Order Number DE83000965.

A reference data base and standard methodology are needed for performing comparative nuclear and fossil power generation cost analyses for DOE/NE. Proposals are presented for such a methodology and for reference assumptions and data to be used with the methodology. This report is intended to provide basic guidelines or a starting point for analysis and to serve as a focal point in establishing parameters and methods to be used in economic comparisons of nuclear systems with alternatives. The data base is applicable for economic comparisons of new base-load light water reactors on either a current once-through cycle or self-generated recycle, high- and low-sulfur coal-fired plants, and oil and natural gas-fired electric generating plant coming on line in the last decade of this century. This paper includes a data base containing proposed technical and economic assumptions to be used in analyses, discussions of a recommended methodology to be used in calculating power generation costs, and a sample calculation for illustrative and benchmark purposes.

2181 **(DOE/NE/50008—T1) Modification and expansion of the EMIS: Enrichment Management Information System. Final report.** Joseph, L.; Pullman, L.; Gingold, J.E. (Stoller (S.M.) Corp., New York (USA)). 8 Oct 1982. Contract AC05-82NE50008. 15p. NTIS, PC A02/MF A01. Order Number DE83001123.

This document describes the changes that have been made to the EMIS Program and its associated Data Bases. Derivation of PWR and BWR availability data is also discussed. (DLC)

2182 **(EUR—5914-DE) Method for computing the cost of electric current generation for nuclear power plants and conventional heating plants.** (Commission of the European Communities, Brussels (Belgium). Directorate General for Research, Science and Education). 1981. 62p. (In German). European Community Information Service, 2100 M St., N.W., Washington, DC 20037.

A description is given of mathematical formulas derived for comparing operating costs per kilowatt hour for nuclear and fossil fuel heating plants as well as examples of practical applications of the cash value method. Tabulated data are given for fresh uranium fuel and expended fuel numerical characteristics.

2183 (GRS—17(8-80), pp 12-27) **Demands on personnel and personnel organisation to assure the safety of nuclear power plants on the basis of operating experience.** Kraemer, H. Aug 1980. (In German). NTIS (US Sales Only), PC A19/MF A01.

From Symposium on personnel organization and qualification by establishment and operation of nuclear power stations; Koeln, F.R. Germany (10 Jun 1980).

The safe operation of nuclear power plants is mainly determined by technical, organizational and human factors. This paper deals with organizational and human factors only. Starting from the instruction and training of the plant operating personnel the organization of a nuclear power plant is described with following comments and evaluations of the operating experience. Finally, the development of the relevant rules and regulations and the consequences resulting for the operation of the power plants, are discussed.

2184 (GRS—17(8-80), pp 28-47) **Personnel organisation of the producer during erection and startup until tuning over to the operator.** Kirchweger, K. Aug 1980. (In German). NTIS (US Sales Only), PC A19/MF A01.

From Symposium on personnel organization and qualification by establishment and operation of nuclear power stations; Koeln, F.R. Germany (10 Jun 1980).

Description of the contractor's organization for construction and commissioning of a Nuclear Power Plant on a turn-key basis. The timely sequence and the structure of tasks requests the assignment of duties of two separate groups - one for the construction phase and the other for the commissioning phase. Both are part of the contractor's site management. For the construction group terms, tasks and responsibilities will be described at first. Here will be also included a description of the tasks for work safety, quality assurance and control. Secondly the group which is responsible for commissioning and operation will be discussed. Also on the program are duties and powers of the commissioning manager, shift-leaders and the leaders of groups to which special technical tasks are assigned.

2185 (GRS—17(8-80), pp 48-55) **Personnel organisation of the producer during erection and startup until turning over of the plant to the user.** Schmidt, H.P. Aug 1980. (In German). NTIS (US Sales Only), PC A19/MF A01.

From Symposium on personnel organization and qualification by establishment and operation of nuclear power stations; Koeln, F.R. Germany (10 Jun 1980).

The paper discusses the erection and startup organizations of suppliers of turn-key nuclear power plants in Germany. Some aspects of the suppliers engineering organizations are discussed, too. A comparison is made of the organizations of the various suppliers in the Federal Republic of Germany. The influence a utility's organization may have on the vendor's organization as well as certain aspects of the support which may be provided by the utility's organization are addressed. Furthermore, administrative measures to be taken assuring an orderly transfer of hardware and software responsibilities from the erection organization to the startup organization are described.

2186 (GRS—17(8-80), pp 56-74) **Expert knowledge of persons responsible for erection and startup.** Koch, M. Aug 1980. (In German). NTIS (US Sales Only), PC A19/MF A01.

From Symposium on personnel organization and qualification by establishment and operation of nuclear power stations; Koeln, F.R. Germany (10 Jun 1980).

An outline is given of the duties and die spheres of responsibility of the senior erection and commissioning personnel. The qualifications required are described by means of an account of the career background of a site manager and a commissioning manager, and of the supporting training courses.

2187 (GRS—17(8-80), pp 75-84) **Expert knowledge of the persons responsible for erection and startup.** Brand, W. Aug 1980. (In German). NTIS (US Sales Only), PC A19/MF A01.

From Symposium on personnel organization and qualification by establishment and operation of nuclear power stations; Koeln, F.R. Germany (10 Jun 1980).

Starting from the tasks of the startup personnel and the division of tasks within the organization the planning and execution of the measures to ensure the necessary qualification (Fachkunde) of the different groups of individuals are described. In addition, our experiences concerning the technical and academic background of the startup personnel and the courses, including simulator training, carried out up to now is reported.

2188 (GRS—17(8-80), pp 101-114) **Expert knowledge of other groups of persons working in erection and start-up.** Hinterwaelder, J. Aug 1980. (In German). NTIS (US Sales Only), PC A19/MF A01.

From Symposium on personnel organization and qualification by establishment and operation of nuclear power stations; Koeln, F.R. Germany (10 Jun 1980).

This discussion concentrates on KWU construction and commissioning personnel who perform under supervision of persons in charge. The most important requirements for construction and commissioning are lined out in order to depict the type of necessary knowledge for this kind of personnel. Various software aids

for commissioning work that are at the disposal of an engineer on a construction site are dealt with in particular. Training on-the-job is emphasized as the most essential means of forwarding knowledge. In addition, selective activities of training are described, e.g. internal and external courses of instruction, seminars and also methods for a controlled experience feedback.

2189 (GRS—17(8-80), pp 115-126) **Expert knowledge of persons responsible for management and supervision of operation.** Gutmann, H.B. Aug 1980. (In German). NTIS (US Sales Only), PC A19/MF A01.

From Symposium on personnel organization and qualification by establishment and operation of nuclear power stations; Koeln, F.R. Germany (10 Jun 1980).

Todays practice is outlined following the historical development of the guidelines for the proof of professional qualification. Qualification demands for the responsible personnel within the power plant organisation are touched and the task of the operator concerning personnel qualification is described.

2190 (GRS—17(8-80), pp 127-138) **Expert knowledge of other groups of persons working in nuclear power plants.** Ellmer, M. Aug 1980. (In German). NTIS (US Sales Only), PC A19/MF A01.

From Symposium on personnel organization and qualification by establishment and operation of nuclear power stations; Koeln, F.R. Germany (10 Jun 1980).

As the BMI plans to establish a guideline on the necessary knowledge of those persons, who are otherwise engaged in the operation of nuclear power plants, some comments on most important points from the operating organization's view are given. Especially the following questions are discussed: Which contributions to safety are given by this guideline. Which points are to be guaranteed by the operating organization, and for what reason. Who of the staff belonges to the 'persons otherwise engaged' and how is information given to these people. Proposals for the establishing of guidelines near to the practice and for modifications of guidelines are made.

2191 (GRS—17(8-80), pp 142-153) **Commissioners in nuclear power plants and their role during operation.** Schroeder, H.J. Aug 1980. (In German). NTIS (US Sales Only), PC A19/MF A01.

From Symposium on personnel organization and qualification by establishment and operation of nuclear power stations; Koeln, F.R. Germany (10 Jun 1980).

The species of officials in nuclear power plants and the requirements set on them are described as well as their position in the organization of the plant.

2192 (GRS—17(8-80), pp 154-158) **Expert knowledge of outside personnel.** Hinterwaelder, J.; Spang, A. Aug 1980. (In German). NTIS (US Sales Only), PC A19/MF A01.

From Symposium on personnel organization and qualification by establishment and operation of nuclear power stations; Koeln, F.R. Germany (10 Jun 1980).

Maintenance contractors personnel will be employed in nuclear power plants on the basis of special instructions, under health physics control and mostly under expert supervision. The 'requisite qualification' of this personnel - beyond to the requisite qualification in the field - can be imparted in a short instruction and briefing on the job.

2193 (GRS—17(8-80), pp 159-176) **Quality assurance and radiation protection requirements on service company personnel.** Berners, O.; Palmowski, J. Aug 1980. (In German). NTIS (US Sales Only), PC A19/MF A01.

From Symposium on personnel organization and qualification by establishment and operation of nuclear power stations; Koeln, F.R. Germany (10 Jun 1980).

Examples show the large scale of activities of service companies, which reach from simple cleaning works up to difficult repairs or to radiation protection services. The demands of radio-protection to the organisation and qualification to service companies are similar to these to the plant supplier and operation personnel of nuclear facilities. For the demands of quality assurance one can see the same result fo a comparison.

2194 (GRS—17(8-80), pp 181-186) **Industrial psychology aspects of power plant operators.** Peche, D. Aug 1980. (In German). NTIS (US Sales Only), PC A19/MF A01.

From Symposium on personnel organization and qualification by establishment and operation of nuclear power stations; Koeln, F.R. Germany (10 Jun 1980).

The paper gives a survey of the development of the negotiationes that have taken place from the beginning 1976 between representatives of BMI and VDWE to examine whether psychological qualification examinations for the shift personal of nuclear power plants will be appropriate. As a result it is shown that first- and reexaminations shall be carried out according principle 25, the psychological part of this examination should, however, be renounced to a still pending standardisation and testing. The more detailed examination of the sense organs, proposed on this occasion, will be defined by the representatives of VDEW by a new proposal. The routine psychological judgement along with a documentation of the superiors is, however, not considered suitable.

2195 (GRS—17(8-80), pp 187-192) **Aspects of working psychology from the operator's point of view.** Sprotte, M. Aug 1980. (In German). NTIS (US Sales Only), PC A19/MF A01.

From Symposium on personnel organization and qualification by establishment and operation of nuclear power stations; Koeln, F.R. Germany (10 Jun 1980).

Psychological factors which may influence the vigilance of the monitoring personnel in man-machine-systems will be treated. The influence of such factors on the safety standard of the technical systems in nuclear power plants is discussed.

2196 (GRS—17(8-80), pp 193-201) **Selected aspects of industrial psychology in reactor operation.** Bohr, E.; Thau, G. Aug 1980. (In German). NTIS (US Sales Only), PC A19/MF A01.

From Symposium on personnel organization and qualification by establishment and operation of nuclear power stations; Koeln, F.R. Germany (10 Jun 1980).

An appropriate consideration of human factors in the operation of nuclear power plants may contribute to plant safety and availability. This requires an adequate evaluation of the role and the significance of human factors and a realistic understanding of human characteristics and needs. Some common misconceptions are discussed, and some outlines for future developments are proposed.

2197 (GRS—17(8-80), pp 202-207) **Aspects of industrial psychology in power plant operation from the employee's point of view.** Heppner, J. Aug 1980. (In German). NTIS (US Sales Only), PC A19/MF A01.

From Symposium on personnel organization and qualification by establishment and operation of nuclear power stations; Koeln, F.R. Germany (10 Jun 1980).

The working-psychological stress of the colleagues during their duty hours in a nuclear power plant is lined out with respect to education, maintenance and proof of the technical qualification. Of special significance is the behaviour of the staff during pre-commissioning, commissioning, normal operation and abnormal operation of a nuclear power plant. In line of duty special stress is added for employees by the strange behaviour of politicians, mass-media and neighbours. The proposals for modification in relation to the education of shift supervisors are shown in a critical view.

2198 (GRS—17(8-80), pp 213-221) **Safety at work due to staff qualification and selection.** Brandt, W. Aug 1980. (In German). NTIS (US Sales Only), PC A19/MF A01.

From Symposium on personnel organization and qualification by establishment and operation of nuclear power stations; Koeln, F.R. Germany (10 Jun 1980).

An outline of basic requirements enabling the selection of employees for responsible staff in nuclear power stations. Illustrated further by the example of a model development from skilled worker to head of shift. A short reference will be made to the maintenance of high standards of training.

2199 (GRS—17(8-80), pp 222-236) **Systematic training in power plant producing organisations.** Sauer, A. Aug 1980. (In German). NTIS (US Sales Only), PC A19/MF A01.

From Symposium on personnel organization and qualification by establishment and operation of nuclear power stations; Koeln, F.R. Germany (10 Jun 1980).

Industrial training measures are carried out in an industrial style. Planning, realization, evaluation, and quality assurance follow fixed rules. The training system is at once felxible and readily standardized. As regards the organizational structure, a training project is similar to that of any engineering project. The number of professional trainers is steadily on the rise.

2200 (GRS—17(8-80), pp 237-241) **Training system for technical personnel of producers.** Kleiner, E. Aug 1980. (In German). NTIS (US Sales Only), PC A19/MF A01.

From Symposium on personnel organization and qualification by establishment and operation of nuclear power stations; Koeln, F.R. Germany (10 Jun 1980).

The training system of BBC Mannheim for technical personnel is divided in different activities, according to the different target groups and tenors. Different departments take care of this activities, which supply one another. Problem, training activities and methods are described.

2201 (GRS—17(8-80), pp 242-264) **Training of the operating personnel of nuclear power plants by the power plant producer.** Jenneskens, U. Aug 1980. (In German). NTIS (US Sales Only), PC A19/MF A01.

From Symposium on personnel organization and qualification by establishment and operation of nuclear power stations; Koeln, F.R. Germany (10 Jun 1980).

The training of the operating personnel of nuclear power plants consists basically of initial training and retraining. The initial training takes place prior to commissioning. Including the basic training it lasts several years. Recent BMI regulations cal for the retraining of the operating personnel in order to maintain the level of special knowledge. The lecture at hand deals primarily with the training provided by manufacturer within the scope of the initial training. The experience which has been gained up to now will be discussed and recommendations will be made for future training plans. Finally the training modules of KWU for retraining will be discussed.

2202 (GRS—17(8-80), pp 273-288) **Simulatortraining.** Reiss, E. Aug 1980. (In German). NTIS (US Sales Only), PC A19/MF A01.

From Symposium on personnel organization and qualification by establishment and operation of nuclear power stations; Koeln, F.R. Germany (10 Jun 1980).

After a shot description of the simulators for PWR- and BWR-systems the training programs offered are outlined. The possibilities and aims of training with simulators are illustrated by means of the existing experience of the operating organizations. In critical view possible improvements are shown.

2203 (GRS—17(8-80), pp 289-304) **Improvement of the efficiency of German simulators and development of simulator technology.** Martin, H.D. Aug 1980. (In German). NTIS (US Sales Only), PC A19/MF A01.

From Symposium on personnel organization and qualification by establishment and operation of nuclear power stations; Koeln, F.R. Germany (10 Jun 1980).

Starting with the use air and space craft training simulators have become very important also for power plant personnel training. The first NPP simulators were built in the US in the late sixties. In Germany three simulators are in operation since 1978. They belong to the second simulator generation. Tendencies of future development will be concentrated on the improvement of the simulation of the power plant. In a long run they will also cover computer and interface technology, the software structure and special instructor functions.

2204 (GRS—17(8-80), pp 308-319) **Training of responsible operating personnel.** Hofmann, W. Aug 1980. (In German). NTIS (US Sales Only), PC A19/MF A01.

From Symposium on personnel organization and qualification by establishment and operation of nuclear power stations; Koeln, F.R. Germany (10 Jun 1980).

A subarea of specialized training for 'Responsible Operating Personnel at Nuclear Power Stations' in accordance with the BMI (BMI = Federal Ministry of the Interior) guideline dated May 10, 1978 may be expediently dealt with outside nuclear power stations. This applies to the section covering 'Nuclear Fundamentals'. For this purpose, four training centres in the Federal Republic of Germany are offering special training facilities. The aim is to provide for external training in the subarea 'Nuclear Fundamentals' which, after having been duly completed 'in accordance with the BMI guideline', can be recognized throughout the Federal Republic by means of a final examination at the respective training centra. In the final examination on technical instruction inside nuclear power stations, it would then no longer be necessary for the competent licensing authorities of the Federal states (Laender) to re-examine staff members in this subarea for their admittance to the functions of: reactor operators, substitute shift heads, and shift heads especially if the persons concerned are to perform such activities for the first time on their own responsibility.

2205 (GRS—17(8-80), pp 320-330) **Qualification of quality testing personnel, in particular the training offered.** Knoedler, D. Aug 1980. (In German). NTIS (US Sales Only), PC A19/MF A01.

From Symposium on personnel organization and qualification by establishment and operation of nuclear power stations; Koeln, F.R. Germany (10 Jun 1980).

Personnel qualification is one of the most important tasks of quality assurance. The qualification is reached by professional education, by experience made on the job and by additional external and company-internal training. A determination of qualification requirements should cover only the general principles. Especially this should be considered specifying the requirements for theoretical knowledge and for examinations since the factor of relevant experience is difficult to be estimated by third parties. Equal principles apply for the personnel of the manufacturer, of the main contractor, of the utility and of the auhtorized inspectors' organizations. The detailed guidelines should be part of the internal QA-systems of the organizations involved.

2206 (GRS—17(8-80), pp 347-356) **Principles of radiation protection training of power plant personnel.** Spiess, R. Aug 1980. (In German). NTIS (US Sales Only), PC A19/MF A01.

From Symposium on personnel organization and qualification by establishment and operation of nuclear power stations; Koeln, F.R. Germany (10 Jun 1980).

After a general presentation of the principles of radiation protection, the author enumerates the different levels where most efforts have to be done. It results from this enumeration the necessity to deal with the 'human component' in nuclear energy, in order to show why the 'training of behaviours' during the instruction of specialists does not lead to the aims attempted. Human beings have to be adapted to work in an environment where energetic radiation is involved. The influence of such a situation on man is complex. It is necessary to carry on the instruction for this environmental situation also after basis instruction in order to qualify a specialist for such an activity.

2207 (GRS—17(8-80), pp 371-378) **Remarks on the assessment of personnel qualification in nuclear power plants.** Bohr, E.; Brigham, F.R. Aug 1980. (In German). NTIS (US Sales Only), PC A19/MF A01.

From Symposium on personnel organization and qualification by establishment and operation of nuclear power stations; Koeln, F.R. Germany (10 Jun 1980).

The contribution of operator qualification to the efficiency and safety of nuclear power plants is discussed. The limitations of this contribution are demonstrated by a comparison with other performance shaping factors involving ergonomic, technical and organizational characteristics of the work situation. Work and task analyses are considered to be valid decision aids for determining the contents, objectives and procedures of operator qualification.

2208 (GRS—17(8-80), pp 379-385) **Criteria for assessing expert knowledge and reliability of responsible persons in nuclear facilities and experience gained in the testing of expert knowledge and reliability.** Walther, J. Aug 1980. (In German). NTIS (US Sales Only), PC A19/MF A01.

From Symposium on personnel organization and qualification by establishment and operation of nuclear power stations; Koeln, F.R. Germany (10 Jun 1980).

The reports shows the criteria and standards set for those persons who have to take the responsibility for erection and for operating and supervising a nuclear power plant. Experiences from the testing of expert knowledge and reliability are presented.

2209 (GRS—17(8-80), pp 386-394) **Experiences in testing for expert knowledge.** Knuefer, H. Aug 1980. (In German). NTIS (US Sales Only), PC A19/MF A01.

From Symposium on personnel organization and qualification by establishment and operation of nuclear power stations; Koeln, F.R. Germany (10 Jun 1980).

Since 1975 training and examination of responsible personnel operating in nucelar power plants is done on the basis of the 'Guideline Relating to the Proof of the Technical Qualification of Nuclear Power Plant Personnel' issued by hte Federal Minister of Interior (BMI). The experience up to now centrally gained by the Company for Reactorsafety (GRS) is fixed in two reports. These reports besides the personal experience of the GRS-participant within the board of examiners are the basis for the following statements.

2210 (GRS—17(8-80), pp 357-363) **Training of fire protection personnel in nuclear power plants.** Blaser, W. Aug 1980. (In German). NTIS (US Sales Only), PC A19/MF A01.

From Symposium on personnel organization and qualification by establishment and operation of nuclear power stations; Koeln, F.R. Germany (10 Jun 1980).

Training of fire protection personnel in nuclear power plants is divided up in three categories: training of fire protection commissioners which is mostly carried out externally; training of fire fighting personnel in the form of basic and repeated training usually by the fire protection commissioner; training of other employers with regard to behaviour in case of fire and during work involving a fire hazard.

2211 (NUREG/CR—2522) **Evaluation of nuclear facility decommissioning projects: program plan. Technical report.** Miller, R.L.; Paasch, R.A. (UNC Nuclear Industries, Inc., Richland, WA (USA)). Apr 1982. 30p. NTIS, PC A03/MF A01.

This Program plan describes a multi-year program initiated by the Nuclear Regulatory Commission (NRC) to assess and evaluate the methods, radiation exposure and costs associated with decommissioning of retired nuclear facilities. The objective of this program is to provide the NRC licensing staff with comparative data that will allow assessment of decommissioning alternatives for regulatory and ALARA implementation of future decommissioning proposals. The program is currently limited to nuclear reactors.

2212 (UNI-SA—104) **UNC Nuclear Industries' human-factored approach to the operating or maintenance procedure.** Nelson, A.A.; Clark, J.E. (UNC Nuclear Industries, Inc., Richland, WA (USA)). 1982. Contract AC06-76RL01857. 12p. (CONF-821018—7). NTIS, PC A02/MF A01. Order Number DE82022159.

From IEEE/ASME/ASCE joint power generation conference; Denver, CO, USA (17 Oct 1982).

The development of Human Factors Engineering (HFE) and UNC Nuclear Industries' (UNC) commitment to minimizing the potential for human error in the performance of operating or maintenance procedures have lead to a procedure upgrade program. Human-factored procedures were developed using information from many sources including, but not limited to, operators, a human factors specialist, engineers and supervisors. This has resulted in the Job Performance Aid (JPA). This paper presents UNC's approach to providing human-factored operating and maintenance procedures.

2213 **Assessing the need for power: a regional econometric model.** Chern, W.S. (Lawrence Livermore National Lab., CA); Just, R.E. *Energy Economics;* 4: No. 4, 232-239(Oct 1982). Contract W-7405-ENG-26.

The growing controversy over nuclear power has demanded a critical evaluation of the need for power to justify proposed nuclear power plants. This paper discusses the use of an econometric model developed for the US Nuclear Regulatory Commission to conduct an independent assessment of electricity demand forecasts related to the licensing of nuclear power plants. The model forecasts electricity demand and price by sector and by state. The estimation and forecasting results for the New England region are presented as a case in point where an econometric model has been used to analyze alternative fuel-price scenarios and to aid substantive public decision-making regarding new nuclear power plant decisions. 16 references, 5 tables.

2109 Process Heat Reactors

REFER ALSO TO CITATION(S) 1561

2214 (EUR—7938-EN) **Technico-economic analysis of large-scale uses of oxygen. Final report.** Tseung, A.C.C.; Chan, H.C.; Hibbert, D.B. (City Univ., London (UK)). 1982. 61p. European Community Information Service, 2100 M Street NW, Suite 707, Washington, DC 20037.

Information is presented concerning countries which are likely to have off-peak nuclear power; likely supply and demand of oxygen in 1990; oxygen produced by the adoption of the H_2 economy concept; special problems with off-peak oxygen; aquifers and salt dome storage; under water gas bag; use of oxygen for underground coal gasification; use of oxygen in sewage treatment and industrial waste treatment; enriched air combustion; use of oxygen in metal battery; use of oxygen in chemical industries; use of oxygen in the production of synthetic natural gas; use of oxygen to promote the growth rate of fish bred in the cooling water from nuclear reactor cooling towers; and cost of oxygen transmission and storage.

2215 (UEC-DOE—820930) **Feasibility study of the consolidated nuclear steam system for cogeneration of process steam and electric power for a large oil refinery.** (United Engineers and Constructors, Inc., Philadelphia, PA (USA)). Sep 1982. Contract AC01-81NE32077. 88p. NTIS, PC A05/MF A01. Order Number DE83002129.

Portions of document are illegible.

This report evaluates the technical and economic feasibility of a two-unit (1243 MWt each) consolidated nuclear steam system (CNSS), and introduces the integrated light water reactor (ILWR) concept for the supply of process steam and electric power to a typical large oil refinery. The results of the economic analysis are compared to those of a two-unit (1170 MWt each) high temperature gas-cooled reactor (HTGR) plant, of a two-unit (1280 MWt each) conventional coal-fired plant, and of the continued operation of existing oil/natural gas fired cogeneration facilities.

22 NUCLEAR REACTOR TECHNOLOGY

2201 Theory And Calculation

REFER ALSO TO CITATION(S) 1785, 2913, 3350

2216 (CONF-820942—17) **^{238}U issues resolved and unresolved.** de Saussure, G.; Smith, A.B. (Oak Ridge National Lab., TN (USA); Argonne National Lab., IL (USA)). 1982. Contract W-7405-ENG-26. 12p. NTIS, PC A02/MF A01. Order Number DE82022329.

From Nuclear data for science and technology international conference; Antwerp, Belgium (6 Sep 1982).

Portions of document are illegible.

The interaction of 1 eV to 20 MeV neutrons with ^{238}U is discussed with emphasis on recently resolved and remaining issues relevant to both application need and physical understanding. The

apparent inability of older ^{238}U evaluations to predict the measured ^{238}U capture rate in thermal critical lattices has stimulated several recent precise measurements of the ^{238}U cross sections, reanalysis of older data, and improved evaluations. The recent evaluations predict satisfactorily the ^{238}U capture rate in thermal critical lattices. In the region from 1.5 to 4 keV there are differences of the order of 15%, sometimes larger, between the values of the neutron widths of the main resonances reported by several experimenters or obtained by different evaluators. Above 4 keV there are only sparse results of resonance analysis and most evaluations adopt a statistical treatment of the resonance structure. Some factors affecting the determination of the average properties of the resonance parameters are discussed. Above the inelastic-scattering threshold, energy-averaged neutron total, scattering, capture and fission cross sections are reviewed in a unified manner integrating measurement, calculation and evaluation. (n;n') and (n;2n') energy-transfer mechanisms are addressed. Particular attention is given to neutron capture, stressing precisions consistent with applied need. Fission properties are discussed including: prompt and delayed fission-neutron spectra and nubar, and fission-product yields. Physical understanding is assayed, with attention to compound-nucleus and direct-reaction mechanisms, and applications impact is illustrated in the context of fast-breeder-reactor performance. 95 references.

2217 **(KFK—3262) Measurement of ^{235}U fission product decay heat between 15 s and 4000 s.** Baumung, K. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Neutronenphysik und Reaktortechnik; Karlsruhe Univ. (TH) (Germany, F.R.). Fakultaet fuer Maschinenbau). Dec 1981. 92p. (In German). NTIS (US Sales Only), PC A05/MF A01. Order Number DE82750580.

Thesis.

A reduced tandem calorimeter is presented where, by reducing the calorimeter block to be only the cylindrical fuel samples themselves and by the use of thermistors for temperature measurement, thermal time constants of the order of one second have been achieved. The calorimeter can be operated adiabatically as well as in the heat-up mode, thus permitting measurement of the time-dependent temperature rise of LWR-pellet-like samples and also their heat capacities. Both quantities directly yield the portion of the decay heat which is converted into thermal power within the samples. The portion escaping as gamma-rays was measured by use of an energy-flux detector. The total decay heat, the thermal and the escaping gamma-fraction are given in tabular form for cooling times from 15 seconds to 4000 seconds following a 200 second irradiation.

2218 **Double error mode extrapolation procedure.** Vondy, D.R.; Fowler, T.B. (Oak Ridge Natl Lab, Tenn, USA). *Nuclear Science and Engineering;* **80**: No. 1, 198-201(Jan 1982).

A procedure is described for removing two error vectors from the approximation to the solution obtained iteratively. Such a scheme for accelerating convergence can reduce the computation cost of solving neutronics problems as is demonstrated for finite difference diffusion theory. 7 refs.

2202 Components And Accessories

REFER ALSO TO CITATION(S) 2178, 2179, 2259

2219 **(EGG-M—11682) Approximate tolerance intervals, based on maximum-likelihood estimates.** Atwood, C.L. (EG and G Idaho, Inc., Idaho Falls (USA)). 1982. Contract AC07-76ID01570. 22p. (CONF-820878—1). NTIS, PC A02/MF A01. Order Number DE83000563.

From Institute of mathematics and statistics annual meeting; Cincinnati, OH, USA (16 Aug 1982).

Let $X_1,...,$ X/sub n/ be independent random variables with distributions depending on a possibly multidimensional θ. Let Y be an unobserved continuously distributed random variable whose distribution depends on θ. A tolerance interval for Y is desired, satisfying $P[Y\epsilon\ I(X_1,...,X/\text{sub n/})] = \beta$. A naive interval would estimate θ from the X's, and construct the interval assuming that the estimate is exactly correct. This paper assumes standard regularity conditions, and uses Taylor approximations to construct correction terms of order 1/n. The resulting interval is longer than the naive interval, because it takes into account the uncertainty in the estimate of θ. Two examples, one simple and one complex, illustrate the method.

2220 (GRS—17(8-80), pp 339-346) **Training of welders and supervisors of welding.** Zwaetz, R.; Held; Tegetoff. Aug 1980. (In German). NTIS (US Sales Only), PC A19/MF A01.

From Symposium on personnel organization and qualification by establishment and operation of nuclear power stations; Koeln, F.R. Germany (10 Jun 1980).

The training and retraining as well as the requirements set on welders and personnel for supervision of welding are outlined. The relevant German guidelines and standards are cited.

2221 (INIS-mf—7132, pp vp) **Study of radiation damage of steels for light water pressure vessels at UJV.** Vacek, N.; Stoces, B. 1980. (In Czech). NTIS (US Sales Only), PC A09/MF A01.

From Nuclear Research Institute scientific and technical conference; Prague, Czechoslovakia (5 Jun 1980).

Preoperational determination of radiation resistance of pressure vessel steels is performed at accelerated neutron exposure in a test or materials research reactor. The results obtained at accelerated and operating exposure are not fully identical and surveillance bodies are therefore used manufactured from the pressure vessel material. Currently, the following steels are used for the manufacture of light water reactor pressure vessels: Mn-Mo-Ni (ASTM-A533-B, ASTM-A508), Cr-Mo-V (15Kh2M1FA). At UJV Rez, for irradiation Chanca-M probes imported from France are used featuring electric temperature control. Almost identical radiation embrittlement was measured for all three steels after irradiation with a neutron fluence of $3x10^{23}$ $n.m^{-2}$ at a temperature of 290 degC. (H.S.).

2222 **(Juel-Spez—122) Structure mechanical analysis of prestressed cast-steel pressure vessels with the finite-element-method.** Edalat, B. (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Inst. fuer Reaktorentwicklung; Technische Hochschule Aachen (Germany, F.R.)). Aug 1981. 106p. (In German). Dep. NTIS (US Sales Only), MF A01. Order Number DE82750190.

The analytical pressure analysis is performed for a vessel with solid bottom and top. The basis of the Finite-Element-Method (FEM) and the criteria for the choice of a suitable element type for use in the computer model was investigated. To investigate the exactness of the FE-program a comparison between the analytical solution and the pressure claculated by FEM at a cylindrical vessel was made. For pressure analyses at the test vessel built of steel sections four different computer models (after FEM) were developed. The pressure analysis of a prestressed cast-steel pressure vessel for the transport and for the storage of burnt HTR fuel elements is performed with the aid of computed models after FEM. The method of developing simple computer models for the prestressed pressure vessel with large dimension is explained with an example.

2223 **(NUREG/CR—2638) Snow loads for the design of nuclear power plant structures.** Ellingwood, B.; Harris, J.R. (National Bureau of Standards, Washington, DC (USA). Center for Building Technology). Apr 1982. 52p. NTIS, PC A04/MF A01.

This report describes a research program to characterize snow loads on roofs of nuclear power plant structures and to develop recommendations for operating basis and extreme environmental loads. Snow surveys were conducted to gather field data about the distribution of snow on plant roofs and to correlate roof and ground snow loads. The survey data were integrated with data from similar studies to provide recommendations for structural design. Load combinations involving rain and snow were analyzed probabilistically to provide a basis of comparison with other design basis environmental loads.

2224 **Mechanical behavior of Alloy 800 at 838 K.** Jones, W.B.; Allen, R.M. (Sandia Natl Lab, Albuquerque, NM, USA). *Metallurgical Transactions, [Section] A: Physical Metallurgy and Materials Science;* **13A**: No. 4, 637-648(Apr 1982).

Three commercial heats have been tested in simple tension and in fatigue at constant plastic strain ranges from 0.2 pct. to 1.4 pct. The heats exhibited differences in elevated temperature mechanical properties. These differences were functions not only of heat-to-heat chemistry variations but also of the final annealing treatment. The microstructures of samples cycled to failure were compared with microstructures of the as-received heats. Additional precipitation occurred during fatigue testing. 25 refs.

2225 **Thorium resonance neutron capture (2.6 to 10 kev).** Macklin, R.L. (Oak Ridge Natl Lab, Tenn, USA). *Nuclear Science and Engineering;* **79**: No. 1, 118-123(Sep 1981).

Neutron capture data from measurements on a sample of specially purified thorium metal were reported in an earlier paper. An error in applying the detector gain shift correction has since been found that raises the average capture cross section from these data by 10 to 15% bringing them into better agreement with recent evaluations. These data are presented in this paper. 9 refs.

2226 **(PB—82-191115) Modelling of elasto-plastic material behaviour.** Halleux, J.P. (Commission of the European Communities, Luxembourg). [nd]. 65p. NTIS PC E04/MF E04.

The aim is to set up a mathematical model which represents as closely as possible the response of structures to loading and takes account of the general field equations based on the principles of structural mechanics and the specific constitutive equations defining materials of construction (i.e. body-centered and face-centered cubic materials). Mathematical relationships concerning classical elasto-plastic behavior, isotropic hardening, kinematic hardening, the sub-layer model and the radial return method are presented. The strain rate effect is defined and its relationship to yield stress is described. Attention is concentrated on elasto-plastic behavior characteristics of metallic materials used in nuclear reactor vessels and components.

2203 Fuel Elements

REFER ALSO TO CITATION(S) 1697

2227 **(FEI—1193) To the solution of heat transfer equations in fuel element clusters.** Leonchuk, M.P.; Kumaev, V.Ya.; Dvortsova, L.I. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk. Fiziko-Ehnergeticheskij Inst.). 1981. 18p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702557.

The methods for solving equations of the steady turbulent liquid flow and heat transfer in fuel element clusters are considered. Differential equations are approximated with finite-difference ones on the grids with account for geometric peculiarities of calculational area. Examples of difference equation construction for regular fuel element lattice are given. The methods of accounting for the element shift are considered on the example of a fuel element with a shifted fuel rod. The method of decreasing the number of calculation points based on using the temperature profile expansion inside the fuel element in eigen functions is proposed. This expansion allows determination of boundary conditions on the fuel element can without finite-difference solution of heat transfer equation inside the fuel element. For grid equations obtained the solution algorithm based on the method of variable directions is proposed.

2228 **(WCAP—7250-Rev.1) Zorita irradiation program: fuel rod fabrication.** Lange, R.A.; Sugarman, A.C. (Westinghouse Electric Corp., Pittsburgh, PA (USA). Nuclear Fuel Div.). Oct 1982. 75p. NTIS (US Sales Only), PC A04/MF A01. Order Number DE83001230.

Portions of document are illegible.

Four special test assemblies were manufactured for insertion in the Zorita reactor. Included in these assemblies were 140 special fuel rods and 80 dummy rods containing Al_2O_3 pellets. This report covers the manufacture, by MSL, and inspection of these 220 special rods. This work was done as part of the Zorita Irradiation Program.

2229 **(WCAP—8495-Rev.1) Zorita research and development program on special assembly test rods. Semi-annual progress report for the period ending December 31, 1974.** Balfour, M.G.; Smalley, W.R.; Rim, C.S.; Metcalf, N.R. (Westinghouse Electric Corp., Pittsburgh, PA (USA). Nuclear Energy Systems Div.). Oct 1982. 65p. NTIS (US Sales Only), PC A04/MF A01. Order Number DE83001237.

This report evaluates the post-irradiation data on fuel rods from the Zorita Special Test Assemblies that have been generated as part of the Research and Development Program. The period from July 1 through December 31, 1974 is covered in this report. Comparisons between measured data and design code predictions are made, as well as a comparison of data generated at different sites by different personnel. In addition, an overall judgment of fuel rod behavior is made for those rods for which comprehensive data are available. Previous semi-annual progress reports have been issued as references 1, 2, and 3.

2230 **(EUR—7142-EN) Non-destructive testing of five fuel rods irradiated in Garigliano BWR up to 20,000 MWd/t.** (Commission of the European Communities, Luxembourg). [nd]. 38p. NTIS PC E03/MF E03.

Non-destructive examination of five LWR oxide fuel rods from the Garigliano power station was carried out at the Riso National Laboratory during the period 1.9.1976 to 1.3.1977. Four of the rods contained fuel with initially 0.82% to 3.2% Pu in natural uranium; the fifth rod, to be regarded as a reference rod, was enriched in uranium. The burn-up level is estimated to be 20.000 MWD/t MeO2. None of the extensive examinations carried out indicate the presence of potential failures. From the test results obtained so far it may be concluded that the performance of the rods up to a burn-up level of 20,000 MWD/t MeO2 has been satisfactory.

2231 **(EUR—7144-EN) Post-irradiation examinations of 5 fuel rods from MO bundles irradiated in the Garigliano BWR up to 15 MWd/kg. Topical report on nondestructive and destructive results.** Bladini, F.; Lepcsky, C.; Pistella, F.; Cruciani, G.; Peroni, P. (Commission of the European Communities, Luxembourg). [nd]. 290p. NTIS PC E11/MF E11.

A program is in progress by ENEL and CNEN to investigate the performance of UO2PuO2 fuel, recycled in light-water reactors. This report describes the results of examinations at the reactor site and of the extensive post-irradiation examination of five rods which experienced up to 15,000 MWD/t in the hot cells at Riso (Denmark). The results of these examinations show that the fuel performed satisfactorily. Further examinations will take place with rods after 20,000 and 25,000 MWD/tons.

2204 Control Systems

2232 **(ANL—82-13) Control rods in LMFBRs: a physics assessment.** McFarlane, H.F.; Collins, P.J. (Argonne National Lab., IL (USA)). Aug 1982. Contract W-31-109-ENG-38. 183p. NTIS, PC A09/MF A01. Order Number DE83000935.

Portions of document are illegible.

This physics assessment is based on roughly 300 control rod worth measurements in ZPPR from 1972 to 1981. All ZPPR assemblies simulated mixed-oxide LMFBRs, representing sizes of 350, 700, and 900 MWe. Control rod worth measurements included single rods, various combinations of rods, and Ta and Eu rods. Additional measurements studied variations in B_4C enrichment, rod interaction effects, variations in rod geometry, neutron streaming in sodium-filled channels, and axial worth profiles. Analyses were done with design-equivalent methods, using ENDF/B Version IV data. Some computations for the sensitivities to approximations in the methods have been included. Comparisons of these analyses with the experiments have allowed the status of control rod physics in the US to be clearly defined.

2233 **(EGG-EE—5924) Optimal estimation and control in nuclear power plants.** Purviance, J.E.; Tylee, J.L. (Idaho National Engineering Lab., Idaho Falls (USA)). Aug 1982. Contract AC07-76ID01570. 57p. NTIS, PC A04/MF A01. Order Number DE83000492.

Optimal estimation and control theories offer the potential for more precise control and diagnosis of nuclear power plants. The important element of these theories is that a mathematical plant model is used in conjunction with the actual plant data to optimize some performance criteria. These criteria involve important plant variables and incorporate a sense of the desired plant performance. Several applications of optimal estimation and control to nuclear systems are discussed.

2234 **(EGG-EE—5965) Heuristic introduction to estimation methods.** Feeley, J.J.; Griffith, J.M. (Idaho National Engineering Lab., Idaho Falls (USA)). Aug 1982. Contract AC07-76ID01570. 21p. NTIS, PC A02/MF A01. Order Number DE83000491.

The methods and concepts of optimal estimation and control have been very successfully applied in the aerospace industry during the past 20 years. Although similarities exist between the problems (control, modeling, measurements) in the aerospace and nuclear power industries, the methods and concepts have found only scant acceptance in the nuclear industry. Differences in technical language seem to be a major reason for the slow transfer of estimation and control methods to the nuclear industry. Therefore, this report was written to present certain important and useful concepts with a minimum of specialized language. By employing a simple example throughout the report, the importance of several information and uncertainty sources is stressed and optimal ways of using or allowing for these sources are presented. This report discusses optimal estimation problems. A future report will discuss optimal control problems.

2235 **(EGG-M—04382) Safety parameter display system: a progress statement.** Meyer, O.R.; Harmon, D.L.; Long, A.B.; Spurgin, A.J. (EG and G Idaho, Inc., Idaho Falls (USA); Combustion Engineering, Inc., Windsor, CT (USA); Electric Power Research Inst., Palo Alto, CA (USA); General Atomic Co., San Diego, CA (USA)). 1982. Contract AC07-76ID01570. 13p. (CONF-820705—9). NTIS, PC A02/MF A01. Order Number DE83000539.

From 2. joint ASME/ANS nuclear engineering conference; Portland, OR, USA (25 Jul 1982).

The first technical recommendation of the President's Commission on the Three Mile Island (TMI) accident was that state-of-the-art technology should be introduced into the Main Control Room (MCR) of nuclear power plants. Key elements in the emergency response facilities are the safety parameter display system (SPDS) and the technical support center (TSC). The SPDS and TSC reflect a decision not to redesign and rebuild the MCR, but instead to add state-of-the-art technology. The SPDS is installed in the MCR and interfaces with the new crew member in the MCR, the shift technical advisor (STA), and existing crew members. The implementation and characteristics of the SPDS display structure will be discussed first. The function of the SPDS displays and their integration with the reactor operator's tasks will be discussed second.

2236 **(EGG-M—07082) Advanced display concepts in nuclear control rooms.** Clark, M.T.; Banks, W.W.; Blackman, H.S.; Gertman, D.I. (EG and G Idaho, Inc., Idaho Falls (USA)). 1982. Contract AC07-76ID01570. 11p. (CONF-820815—2). NTIS, PC A02/MF A01. Order Number DE83000756.

From 2. ASME international computer engineering conference; San Diego, CA, USA (15 Aug 1982).

Precursors necessary for the development of a full-scale predictor display/control system have been under development since the mid 1940's. The predictor display itself has been available for use in manual control systems since 1958. However, the nuclear industry has not yet explored the uses and benefits of predictor systems. The purpose of this paper is to provide information on the application of this technology to the nuclear industry. The possibility of employing a simulation-based control system for nuclear plant systems that currently use conventional auto/manual schemes is discussed. By employing simulation-based systems, a predictor display could be made available to the operator during manual operations, thus facilitating control without outwardly affecting the overall control scheme.

2237 (GRS—17(8-80), pp 265-269) **Customer training by the producer. Experience in process control training.** Kleiner, E. Aug 1980. (In German). NTIS (US Sales Only), PC A19/MF A01.

From Symposium on personnel organization and qualification by establishment and operation of nuclear power stations; Koeln, F.R. Germany (10 Jun 1980).

A typical task of training customers is training of the subject of process control. With regard of the different conditions, personnel groups (with different training aims) must be appointed and methods must be chosen. The result are some important training tasks, arranged according to the personnel groups.

2238 **Quality assurance system of Electricite de France for nuclear power plants.** Boissonnet, B.; Capel, R.; Doucet, Y.; Laurent, L. (Electricite de France, Evry). pp 41-48 of Quality assurance for nuclear power plants. Proceedings of an international symposium organized by the IAEA and held in Paris, 11-15 May 1981. Vienna, Austria; IAEA (1982). (In French)

From International symposium on quality assurance for nuclear power plants; Paris, France (11 - 15 May 1981).

Because of the scale of its nuclear programme, Electricite de France (EDF) has established a quality assurance system aimed at creating safe and reliable power plants and at their smooth operation. This paper outlines the general rules and practices currently employed by the French industry and EDF. It includes a summary of the general principles of quality assurance systems and from among publications on the subject, particularly those of the IAEA, singles out the four main principles underlying such systems. It describes the application in France of general quality assurance principles, indicating the basic differences in that sphere between France and the United States of America, the practices used by EDF and the obligations of suppliers and subcontractors. EDF's organizational structure for facility design, for the monitoring of in-plant and on-site construction as well as for plant commissioning and operation is also described.

2239 **(PB—82-204447) Guidelines for man-machine interface design. Research report.** Ranta, J.; Westesson, R.; Wahlstroem, B. (Valtion Teknillinen Tutkimuskeskus, Espoo (Finland)). [nd]. 135p. NTIS, PC A07/MF A01.

During the past years the level of automation has considerably increased in modern process plants. One of the consequences has been the changing role of process operators. The operators have to make decisions on a quite abstract level and with abstract conceptions concerning plant economy, safety, availability and product quality. Therefore control room design has become an important factor related to plant safety, economy and reliability. The disturbance and accident analysis in process plants indicate that most of the deficiencies in existing process control rooms can be avoided by improving the design process itself and by ensuring that the designers include to an adequate degree all factors which are relevant and essential to the man-machine interface (MMIF) system and to the operation of the plant at different design stages. The guidelines are intended to provide support in ensuring that everything essential is included in MMIF design.

2205 Environmental Aspects

REFER ALSO TO CITATION(S) 1802, 2074, 2993, 3002, 3027, 3028, 3035

2240 **(KURRI-TR—211) Survey on the supporting ground on the construction site of High Flux Reactor Building in Research Reactor Institute of Kyoto University.** Kamae, Katsuhiro; Fukui, Masami; Katsurayama, Kousuke. (Kyoto Univ., Kumatori, Osaka (Japan). Research Reactor Inst.). 1981. 41p. (In Japanese). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82702544.

As part of the seismic design of the High Flux Reactor building which is planned to be constructed by Kyoto University Research Reactor Institute, the stability of the supporting ground has been analyzed. This report concerns the ground survey which has been carried out to obtain the basic data on the supporting ground. The outline of the ground around the construction site of High Flux Reactor has been already made clear by the last survey. Therefore, the purpose of this ground survey is mainly to make clear the mechanical properties of the soil. The survey has been carried out concerning the supporting ground and several layers deeper than that. The main items obtained are as follows. (1) modulus of deformation (2) breaking strength and creep strength (3) coefficient of permeability (4) ground water level.

2241 **(SSI-K—81-07) Release of activity and occupational exposures of the nuclear power industry. Quarterly report, 3rd quarter 1981.** (Statens Straalskyddsinstitut, Stockholm (Sweden)). Dec 1981. 13p. (In Swedish). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702554.

The release of radioactivity from the nuclear power plants during Jul - Sep 1981 is presented. The figures are given as the equivalent index of collective dose and as standardized release. The personnel doses are also compiled.

2242 **(TVA/PUB—83/1) Radiological-impact assessment, Browns Ferry Nuclear Plant, July-December 1979.** (Tennessee Valley Authority, Chattanooga (USA). Div. of Occupational Health and Safety). 1979. 47p. (RH—80-2-BF1). NTIS, PC A03/MF A01. Order Number DE83900057.

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Doses calculated for this semiannual period result from the low-level effluent releases of units 1, 2, and 3. For gaseous effluents releases in the third quarter, the maximum gamma and beta air doses were calculated to be 1.94 and 12.9 mrad, respectively. During the fourth quarter, the gamma and beta air doses were 2.25 and 16.0 mrad, respectively. These quarterly doses are well below the annual air dose guidelines (as specified in Appendix I to 10CFR50) of 30 and 60 mrad for gamma and beta radiation, respectively for three reactor units. (All doses and dose limits referred to will be totals for the three reactor units.) The maximum doses from external sources to the skin and total body during the third quarter were calculated to be 4.36 and 1.19 mrem. During the fourth quarter, the skin and total body were 5.65 and 1.27 mrem, respectively. These compare with annual dose guidelines of 45 mrem to the skin and 15 mrem to the total body.

2243 **(TVA/PUB—83/3) Radiological-impact assessment, Browns Ferry Nuclear Plant, July-December 1980.** (Tennessee Valley Authority, Chattanooga (USA). Div. of Occupational Health and Safety). 1980. 41p. (RH—81-1-BF-1). NTIS, PC A03/MF A01. Order Number DE83900055.

Portions of document are illegible.

Potential doses to individuals and populations have been calculated for the time period July 1 through December 31, 1980. The calculations have been made using the measured releases for radioactivity in both gaseous and liquid effluents. Dispersion of radioactive effluents in the environment has been calculated using meteorological data and river flow data measured during this period.

2206 Research, Test, And Experimental Reactors

REFER ALSO TO CITATION(S) 2144, 2174, 2229, 2232, 2271, 2272, 2274, 2285, 2290

2244 **(EGG-M—06582) Capabilities of the Power Burst Facility.** Spencer, W.A.; Jensen, A.M.; McCardell, R.K. (EG and G Idaho, Inc., Idaho Falls (USA)). 1982. Contract AC07-76ID01570. 16p. (CONF-820967—2). NTIS, PC A02/MF A01. Order Number DE83000684.

From International topical meeting on irradiation technology; Grenoble, France (28 Sep 1982).

The unique and diverse test capabilities of the Power Burst Facility (PBF) are described in this paper. The PBF test reactor, located at the Idaho National Engineering Laboratory, simulates normal, off-normal, and accident operating conditions of light water reactor fuel rods. An overview description is given, with specific detail on design and operating characteristics of the driver core, experiment test loop, fission product detection system, test train assembly facility, and support equipment which make the testing capability of the PBF so versatile.

2245 **(EGG-PR—5784) Characterization of the Engineering Test Reactor facility.** Kaiser, L.L.; Rolfe, R.L.; Sneed, B.J.; Wills, E.L. (Idaho National Engineering Lab., Idaho Falls (USA)). Sep 1982. Contract AC07-76ID01570. 440p. NTIS, PC A19/MF A01. Order Number DE83000682.

The physical and radiological conditions of the inactivated Engineering Test Reactor (ETR) facility are characterized. The 175-MW (thermal) light water reactor was in service from 1957 to 1981 at the Idaho National Engineering Laboratory. The facility is described, radiological survey data and radioactively contaminated and clean material volumes are given, potential hazards of the inactivated facility are identified, and a material volume summary is provided. Decommissioning methods are not addressed. Radiation survey results (in mR/h) and contamination levels (in disintegrations per minute) are given by building, room, or area. Material (waste) volumes are given that were calculated for in-place contaminated wastes (151 036 ft^3). Boxed and oversize contaminated waste volumes and meltable metal volumes are also given. Contaminated waste volumes are approximately 25% of the total ETR facility material volume.

2248 **(HEDL-SA—2612-FP) Method of monitoring subcritical reactivity during core refueling.** Ombrellaro, P.A.; Harris, R.A. (Hanford Engineering Development Lab., Richland, WA (USA)). May 1982. Contract AC06-76FF02170. 13p. NTIS, PC A02/MF A01. Order Number DE83000485.

The Modified Source Multiplication (MSM) technique, was used to measure core subcritical reactivity and core component reactivity worth during a major refueling of the Fast Flux Test Facility (FFTF) core. Measured results were compared with calculated values as a means of verifying core component changouts during the refueling. The results demonstrate the accuracy expected from MSM measurements and show that the technique was very effective in monitoring core subcritical reactivity during a refueling in which the neutron sources changed significantly and were not uniformly distributed.

2247 **(HEDL-SA—2664-FP) Liquid Metal Fast Breeder Reactor plant maintenance and equipment design.** Swannack, D.L. (Hanford Engineering Development Lab., Richland, WA (USA)). 7 Jun 1982. Contract AC06-76FF02170. 18p. (CONF-820705—10). NTIS, PC A02/MF A01. Order Number DE83000486.

From 2. joint ASME/ANS nuclear engineering conference; Portland, OR, USA (25 Jul 1982).

Portions of document are illegible.

This paper provides a summary of maintenance equipment considerations and actual plant handling experiences from operation of a sodium-cooled reactor, the Fast Flux Test Facility (FFTF). Equipment areas relating to design, repair techniques, in-cell handling, logistics and facility services are discussed. Plant design must make provisions for handling and replacement of components within containment or allow for transport to an ex-containment area for repair. The modular cask assemblies and transporter systems developed for FFTF can service major plant components as well as smaller units. The plant and equipment designs for the Clinch River Breeder Reactor (CRBR) plant have been patterned after successful FFTF equipment.

2248 **(HEDL-SA—2694) FFTF operational results.** Peckinpaugh, C.L.; Bennett, R.A.; Wykoff, W.R. (Hanford Engineering Development Lab., Richland, WA (USA)). Jul 1982. Contract AC06-76FF02170. 21p. (CONF-820914—4). NTIS, PC A02/MF A01.

From International conference on nuclear power experience; Vienna, Austria (13 Sep 1982).

The Fast Flux Test Facility (FFTF) is a 400 MWt sodium-cooled fast reactor operating at the Hanford Engineering Develop-

ment Laboratory, Richland, Washington, to conduct fuels and materials testing in support of the U.S. Liquid Metal Fast Breeder (LMFBR). Startup and initial power testing included a comprehensive series of nuclear and non-nuclear tests to verify the thermal and neutronic characteristics of the plant and to demonstrate its inherent safety features. Extensive reactor core characterization measurements have been completed to provide the neutron and gamma spectra, fission rates and other physics data needed to design and evaluate tests irradiated in FFTF. The plant has demonstrated compliance with design criteria and fully satisfied safety requirements. It is now an operating facility performing its assigned mission.

2249 (INIS-mf—7132, pp vp) **Use of WWR-S reactor as radiation source.** Listik, E. 1980. (In Czech). NTIS (US Sales Only), PC A09/MF A01.

From Nuclear Research Institute scientific and technical conference; Prague, Czechoslovakia (5 Jun 1980).

The applications are surveyed of the WWR-S reactor in reactor technology, nuclear physics and irradiation services. A brief description is given of the reactor irradiation channels. (J.B.).

2250 **(KURRI-TR—209) Records of indoor radiation management, no. 16. In the fiscal year of 1979.** Katsurayama, K.; Tsujimoto, T.; Mizuma, N. (Kyoto Univ., Kumatori, Osaka (Japan). Research Reactor Inst.). 1981. 37p. (In Japanese). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82702550.

In fiscal 1979, there were more difficulties concerning radiation control in the Research Reactor Institute, Kyoto University, due to the aging facilities of radiation control and radiation handling. On the other hand, computerization was newly introduced for the collection of data on personal radiation exposure dose, etc. Further, the radiation control concerning the research reactor was reviewed. Covering the fiscal year 1979 (from April, 1979, to March, 1980), the contents are as follows: indoor routine radiation control (spatial dose rate, cumulative dose, surface contamination density, radioactive concentration in water, radioactive dust concentration, radioactive gas concentration and external exposure dose at the site boundary, radiation control for CA building), the decontamination of the CA accelerator and tritium radiation control, special works and abnormality record, regular inspection, (appendix) ^{60}Co and ^{137}Cs problem in drainage.

2251 **(ORNL/TM—8308-Add.1) Oak Ridge National Laboratory Research Reactor Experimenters' Guide.** Cagle, C.D. (comp.). (Oak Ridge National Lab., TN (USA)). Oct 1982. Contract W-7405-ENG-26. 194p. NTIS, PC A09/MF A01. Order Number DE83001635.

The Oak Ridge National Laboratory has three multipurpose research reactors which accommodate testing loops, target irradiations, and beam-type experiments. Since the experiments must share common or similar facilities and utilities, be designed and fabricated by the same groups, and meet the same safety criteria, certain standards for these have been developed. These standards deal only with those properties from which safety and economy of time and money can be maximized and do not relate to the intent of the experiment or quality of the data obtained. The necessity for, and the limitations of, the standards are discussed; and a compilation of general standards is included.

2252 **(ORNL/TM—8434) Oak Ridge Research Reactor. Quarterly report, January, February, and March 1982.** Hurt, S.S. III; Lance, E.D. (Oak Ridge National Lab., TN (USA)). Sep 1982. Contract W-7405-ENG-26. 28p. NTIS, PC A03/MF A01. Order Number DE83000387.

Portions of document are illegible.

The ORR operated at an average power level of 29.9 MW for 82.9% of the time during January, February, and March of 1982. The reactor was shut down on nine occasions, four of which were unscheduled. Reactor downtime needed for refueling, maintenance, and checks was normal, with the reactor remaining available for use 88.7% of the time. Maintenance activities, both mechanical and instrument, were essentially routine in nature with the exception of one Reactor Instrumentation and Controls Design Change Memo. In-service inspection completed during the quarter included: (1) examination of the ORR primary coolant strainers and housing, and (2) inspection of the ORR decay tank.

2253 **(PTB-FMRB—87) Annual report 1980 of the Research and Measurement Reactor Braunschweig.** Kriks, H.J.; Vorbrugg, W. (Physikalisch-Technische Bundesanstalt, Braunschweig (Germany, F.R.). Forschungs- und Messreaktor). Aug 1981. 64p. (In German). Dep. NTIS (US Sales Only), MF A01. Order Number DE82750522.

In 1980 the Forschungs- und Messreaktor Braunschweig (FMRB) has been in action for 2457 hours without any serious disturbance. The experience in the field of reactor operation, in the radiation protection work as well as in the experiments at the beam tubes is reported.

2207 Plutonium And Isotope Production Reactors

REFER ALSO TO CITATION(S) 2212

2254 **(ORNL/TM—1138/R1) Operating manual for the High Flux Isotope Reactor. Volume I. Description of the facility.** (Oak Ridge National Lab., TN (USA)). Sep 1982. Contract W-7405-ENG-26. 484p. NTIS, PC A21/MF A01. Order Number DE83000384.

Portions of document are illegible.

This volume contains a comprehensive description of the High Flux Isotope Reactor Facility. Its primary purpose is to supplement the detailed operating procedures, providing the reactor operators with background information on the various HFIR systems. The detailed operating procdures are presented in another report.

2255 **(ORNL/TM—8518) High Flux Isotope Reactor. Quarterly report, April-June, 1982.** Hurt, S.S.; Poteet, K.H. (Oak Ridge National Lab., TN (USA)). Oct 1982. Contract W-7405-ENG-26. 16p. NTIS, PC A02/MF A01. Order Number DE83001677.

Routine reactor operation with four end-of-cycle shutdowns and two unscheduled shutdowns resulted in an on-stream time of 95.7% for the quarter.

2256 **(PNL—4314) N-reactor charge-discharge system analysis.** Tokarz, R.D.; Marr, G.D.; Nesbitt, J.F. (Pacific Northwest Lab., Richland, WA (USA)). Sep 1982. Contract AC06-76RL01830. 57p. NTIS, PC A04/MF A01. Order Number DE83000304.

This report documents an analysis of the existing systems in the N-Reactor fuel flow path. It recommends equipment improvements and changes in that path to allow the charge-discharge rates to be increased to 500 tubes per outage without increasing reactor outage time. The estimated program cost of $14 million is projected over an estimated 3-year period. It does not include costs detailed as part of the existing restoration program or any costs that are considered as normal maintenance. The recommendations contained in this report provide a direction and goal for every critical aspect of the fuel flow path. The way in which these recommendations are implemented may greatly affect the schedule and costs. Previous studies by UNC have shown that enhanced fuel element handling has the potential of increasing productivity by 33 days at a cost benefit estimated at $18 million per year. Enhanced fuel handling provides the greatest potential for productivity improvement of any of the areas considered in these studies.

2208 Propulsion Reactors

REFER ALSO TO CITATION(S) 2285

2257 **(GKSS—81/E/32) State of the Japanese nuclear research ship MUTSU.** Lettnin, H. (GKSS-Forschungszentrum Geesthacht G.m.b.H., Geesthacht-Tesperhude (Germany, F.R.)). 1981. 7p. (In German). Dep. NTIS (US Sales Only), MF A01. Order Number DE82750191.

A short introductary comment of the German-Japanese cooperation on the field of nuclear ship propulsion is given, which since several years had led to the development of a nuclear propelled containership with 80 000 shp. Against this background the cooperation with the Japanese was renewed for checking the shield modification of NS MUTSU by GKSS. Before the modification of the shielding is dealt with in more detail the design concept of ship and reactor plant of the vessel is presented. The observed defects as well as the rebuilding concept of the changed shielding incl. the shielding calculations. The constructive modifications have led to reconsiderations of safety aspects for ship and reactor. Finally a short description of the repair site in Sasebo is given and an outlook on the nuclear ship development in Japan.

2258 **Nuclear electric propulsion /NEP/ spacecraft for the outer planet orbiter mission.** Garrison, P.W.; Nock, K.T. (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, CA). *AIAA Paper;* No. 82-1276, 1-8(1982). (CONF-820648—).

From 18. joint propulsion conference; Cleveland, OH, USA (21 Jun 1982).

The design, operating features, and a possible Neptune orbit for the spacecraft powered by the SP-100 nuclear electric propulsion (NEP) system under study by NASA and the DOE are described. The system features a reactor and a payload situated on opposite ends of a 0.5 m diam, 11 m long astromast. Mercury-ion thrusters are located beneath the reactor for side thrusting, and no contamination of the payload or obstruction of the viewing angles for scientific objectives occurs with the system, which would not degrade in performance even under high insolation during near-sun maneuvers. Results of a theoretical study of earth escapes are presented to show that an NEP powered spiral trajectory out of a 700 km Shuttle orbit and using a Triton gravity assist would be superior to departing from a 300 km orbit with a Centaur boost. The mission profile includes a 1249 kg Galileo payload. The SP-100 has a 1.4 MWth reactor with UO2 fuel tiles and weighs 19,904 kg.

2209 Reactor Safety

REFER ALSO TO CITATION(S) 1802, 2175, 2176, 2741, 3072

2259 **(CONF-820802—23) Reliability of the emergency ac power system at nuclear power plants.** Battle, R.E.; Campbell, D.J.; Baranowsky, P.W. (Oak Ridge National Lab., TN (USA)). 1982. Contract W-7405-ENG-26. 7p. NTIS, PC A02/MF A01. Order Number DE82022324.

From International meeting on thermal nuclear reactor safety; Chicago, IL, USA (29 Aug 1982).

Portions of document are illegible.

This paper contains an evaluation of the onsite ac power system reliability. The approach to determine the onsite system reliability is to gather from the operating nuclear plants detailed data that have not been available to the NRC, to select typical but detailed design features, and to combine the two to determine ac power system reliability for different designs. Fault trees were constructed from the specific designs, and the categorized data will be used to calculate a spectrum of the expected frequency of station blackout.

2260 **(CONF-820802—36) Operating experience review for nuclear power plants in the Systematic Evaluation Program.** Mays, G.T.; Harrington, K.H. (Oak Ridge National Lab., TN (USA); JBF Associates, Knoxville, TN (USA)). 1982. Contract W-7405-ENG-26. 8p. NTIS, PC A02/MF A01. Order Number DE82022323.

From International meeting on thermal nuclear reactor safety; Chicago, IL, USA (29 Aug 1982).

The Systematic Evaluation Program Branch (SEPB) of the Nuclear Regulatory Commission (NRC) is conducting the Systematic Evaluation Program (SEP) whose purpose is to determine the safety margins of the design and operation of the eleven oldest operating commercial nuclear power plants in the United States. This paper describes the methodology and results of the operational experience review portion of the SEP evaluation. SEPB will combine the results from these operational reviews with other safety topic evaluations to perform an integrated assessment of the SEP plants.

2261 **(CONF-821037—7) Small-scale clad-effects study.** Robinson, G.C. (Oak Ridge National Lab., TN (USA)). 1982. Contract W-7405-ENG-26. 11p. NTIS, PC A02/MF A01. Order Number DE83001926.

From 10. water reactor safety research information conference; Gaithersburg, MD, USA (12 Oct 1982).

Portions of document are illegible.

The Small-Scale Clad Effects Study of the HSST Program was initiated to study the interaction of stainless cladding with flaws initiated in and propagating in base metal. From the designer's viewpoint stainless cladding is primarily viewed as a corrosion- and crud-prevention measure in light-water reactor vessel design, and except for its effect upon fatigue in thermal transients, its effect upon structural integrity has heretofore been largely disregarded. With the more recent focus of safety studies upon LOCA scenarios that emphasize the behavior of small flaws, it has become evident that stainless cladding may have a key role in the propagation and/or arrest of propagating flaws. A complicating factor in understanding the role of stainless cladding in this setting is its fracture toughness as a function of radiation dose and as a function of fabrication process for which meager data exist. The initial phase of this study has attempted to address this question by testing stainless-clad specimens that had been subjected to heat treatments to simulate beginning-of-life and end-of-life toughness conditions to fast-running cracks.

2262 **(EGG-M—9181) Heat transfer during severe core-disruptive accidents in light-water reactors.** Allison, C.M.; Hsieh, T.C.S. (EG and G Idaho, Inc., Idaho Falls (USA)). Sep 1982. Contract AC07-76ID01570. 25p. (CONF-820901—6). NTIS, PC A02/MF A01. Order Number DE83000589.

From 7. international heat transfer conference; Munich, F.R. Germany (6 Sep 1982).

Portions of document are illegible.

As a result of the accident at Three Mile Island, the US Nuclear Regulatory Commission is sponsoring the development of a computer code, designated Severe Core Damage Analysis Package (SCDAP), to analyze light water reactor (LWR) fuel rod bundles during a severe core damage accident (SCDA). This paper is an outgrowth of the conceptual design for SCDAP, concentrating on the thermally related mechanisms in the damaged core. This paper first presents a description of the possible damage progression during a SCDA and then addresses two questions: first, what factors are significant in the core's thermal behavior; and second, what are the expected uncertainties in that behavior.

2263 **(EGG-M—03482) Fission-product source terms measured during fuel-damage tests in the Power Burst Facility.** Osetek, D.J.; King, J.J.; Kumar, R.M. (EG and G Idaho, Inc., Idaho Falls (USA)). 1982. Contract AC07-76ID01570. 10p. (CONF-820802—33). NTIS, PC A02/MF A01. Order Number DE83000409.

From International meeting on thermal nuclear reactor safety; Chicago, IL, USA (29 Aug 1982).

Portions of document are illegible.

Fission-product release from light-water-reactor-type fuel rods to the coolant was measured during eight fuel damage tests in the Power Burst Facility. On-line gamma spectroscopic measurements of short-lived fission products, and important aspects of fission product behavior observed during the tests, are discussed. The fission-product source terms were found to be very time-dependent, requiring 1 to 3 hours for equilibrium levels to be established. Estimates of the release rate constants generated during certain tests are provided. A comparison is made between calculated and measured release signatures for selected isotopes. Iodine behavior is discussed, and fuel fracturing is identified as a strong release mechanism that may substantially contribute to fission product source terms during light-water-reactor accidents where the core is damaged but the fuel does not melt.

2264 **(EGG-M—03782) LWR fuel performance during anticipated transients with scram.** MacDonald, P.E.; Martinson, Z.R.; Rowland, T.C.; Tokar, M. (EG and G Idaho, Inc., Idaho Falls (USA); General Electric Co., San Jose, CA (USA); Nuclear Regulatory Commission, Washington, DC (USA)). 1982. Contract AC07-76ID01570. 8p. (CONF-820802—28). NTIS, PC A02/MF A01. Order Number DE83000413.

From International meeting on thermal nuclear reactor safety; Chicago, IL, USA (29 Aug 1982).

The results of a series of fuel behavior tests in the Power Burst Facility (PBF) at the Idaho National Engineering Laboratory are presented in this paper. Four progressively higher and broader power transients at a constant coolant flow turbine trip rate were performed. The first transient simulated a BWR-5 turbine trip without steam bypass with fuel rods operating at BWR-6 core average powers. The second transient simulated a generator load rejection without steam bypass with fuel rods operating at above core average rod powers. The last two transients were performed at higher powers than safety analysis predicts to be possible in commercial reactors to define failure threshold margins. The test rods did not fail and were not damaged during any of the four transients.

2265 **(EGG-M—04082) Fuel performance during severe accidents.** Buescher, B.J.; Gruen, G.E.; MacDonald, P.E. (EG and G Idaho, Inc., Idaho Falls (USA)). 1982. Contract AC07-76ID01570. 7p. (CONF-820802—41). NTIS, PC A02/MF A01. Order Number DE83000545.

From International meeting on thermal nuclear reactor safety; Chicago, IL, USA (29 Aug 1982).

As a result of the Three Mile Island Unit-2 (TMI-2) accident, the Nuclear Regulatory Commission has initiated a severe fuel damage test program to evaluate fuel rod and core response during severe accidents similar to TMI-2. This program is underway in the Power Burst Facility at the Idaho National Engineering Laboratory. In preparation for the first test, predictions have been performed using the TRAC-BD1 computer. This paper presents the calculated results showing a slow heatup to 2400 K over 5 hours, and the analysis includes accelerated oxidation of the zirconium cladding at temperatures above 1850 K.

2266 **(EGG-M—04182) Assessment of LWR fuel foaming potential during core meltdown accidents.** Cronenberg, A.W.; Croucher, D.W.; MacDonald, P.E. (Hoffman Electronics Corp., Santa Barbara, CA (USA)). 1982. Contract AC07-76ID01570. 13p. (CONF-820802—42). NTIS, PC A02/MF A01. Order Number DE83000548.

From International meeting on thermal nuclear reactor safety; Chicago, IL, USA (29 Aug 1982).

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Fuel melting in severe core damage accidents will lead to the rapid release of fission gas from the fuel matrix and the volatilization of low boiling point metallic inclusions, which can be expected to significantly influence molten fuel dynamics. A quantitative analysis of UO_2 foaming potential is presented here based upon an assessment of the time characteristics for bubble growth, surface escape, film thinning, and bubble coalescence. Analysis indicates that although the potential exists for early molten UO_2 foaming, such foams are basically unstable and tend to collapse, thereby releasing volatilized fission products from the molten fuel debris. Release of such fission products will impact radiological source term evaluation and can result in up to a 40-percent reduction in the residual decay heat within the core bebris.

2267 **(EGG-M—04782) Comparison of BALON2 with cladding ballooning strain tables in NUREG-0630.** Resch, S.C.; Laats, E.T. (EG and G Idaho, Inc., Idaho Falls (USA)). 1982. Contract AC07-76ID01570. 6p. (CONF-820802—32). NTIS, PC A02/MF A01. Order Number DE83000411.

From International meeting on thermal nuclear reactor safety; Chicago, IL, USA (29 Aug 1982).

For this comparison study, the two computer models used for calculating fuel rod cladding failure and the resulting permanent strains were compared against experiment data. The two models considered were the mechanistic BALON2 model and the empirical model described in the NUREG-0630 report. The purpose for making this comparison was simply to gain insight into the relative strengths and weaknesses of each model. The experiment data sample consisted of data from both single and bundle tests conducted sometimes in in-pile facilities, but mostly in out-of-pile facilities. Comparisons between models indicated that the empirical NUREG-0630 model more accurately calculated the local cladding temperature and pressure conditions at rupture, but the mechanistic BALON2 model more accurately calculated the resulting cladding permanent strain at the rupture location.

2268 **(EGG-M—06682) Power Burst Facility severe-fuel-damage test program.** McCardell, R.K.; MacDonald, P.E. (EG and G Idaho, Inc., Idaho Falls (USA)). 1982. Contract AC07-76ID01570. 19p. (CONF-820967—1). NTIS, PC A02/MF A01. Order Number DE83000685.

From International topical meeting on irradiation technology; Grenoble, France (28 Sep 1982).

As a result of the Three Mile Island Unit 2 (TMI-2) accident, the United States Nuclear Regulatory Commission (USNRC) has initiated a severe fuel damage research program to investigate fuel rod and core response, and fission product and hydrogen release and transport during degraded core cooling accidents. This paper presents a discussion of the expected benefits of the PBF severe fuel damage tests to the nuclear industry, a description of the first five planned experiments, the results of pretest analysis performed to predict the fuel bundle heatup for the first two experiments, and a discussion of Phase II severe fuel damage experiments. Modifications to the fission product detection system envisioned for the later experiments are also described.

2269 **(EGG-M—08581) Natural circulation in an experimental facility scaled from a pressurized water reactor.** Loomis, G.G.; Soda, K. (Idaho National Engineering Lab., Idaho Falls (USA)). 1982. Contract AC07-76ID01570. 6p. (CONF-820901—5). NTIS, PC A02/MF A01. Order Number DE83000588.

From 7. international heat transfer conference; Munich, F.R. Germany (6 Sep 1982).

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Results from an experimental investigation of natural circulation in the Semiscale Mod-2A system are presented. From the experimental results, including visual observation, the characteristics of three modes of natural circulation have been quantified. The three natural circulation modes are single-phase, two-phase, and reflux. The various modes of natural circulation were induced in the Mod-2A system by controlling system mass inventory, core power, and steam generator secondary pressure. The transitions between the various modes of natural circulation as a function of system mass inventory and core power are presented. The Semiscale experiments were run with high temperature and pressure water (6.2 to 12.4 MPa). Experimental results were found to compare favorably with RELAP5 computer code calculations.

2270 **(EGG-M—08781) Common-cause failure analysis of McGuire Unit 2 auxiliary feedwater system.** Rasmuson, D.M.; Shepherd, J.C.; Fowler, R.D.; Summitt, R.L.; Logan, B.W. (EG and G Idaho, Inc., Idaho Falls (USA)). 1982. Contract AC07-76ID01570. 10p. (CONF-820705—8). NTIS, PC A02/MF A01. Order Number DE83000540.

From 2. joint ASME/ANS nuclear engineering conference; Portland, OR, USA (25 Jul 1982).

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A powerful method for qualitative common cause failure analysis (CCFA) of nuclear power plant systems was developed by EG and G Idaho at the Idaho National Engineering Laboratory. As a cooperative project to demonstrate and evaluate the usefulness of the method, the Duke Power Company agreed to allow a CCFA of the auxiliary feedwater system (AFWS) in their McGuire Nuclear Station Unit 2. The results of the CCFA are the subject of this discussion.

2271 **(EGG-M—15382) Experiment prediction for LOFT nuclear experiments L5-1/L8-2.** Chen, T.H.; Modro, S.M. (EG and G Idaho, Inc., Idaho Falls (USA)). 1982. Contract AC07-76ID01570. 22p. (CONF-820802—34). NTIS, PC A02/MF A01. Order Number DE83000547.

From International meeting on thermal nuclear reactor safety; Chicago, IL, USA (29 Aug 1982).

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The LOFT Experiments L5-1 and L8-2 simulated intermediate break loss-of-coolant accidents with core uncovery. This paper compares the predictions with the measured data for these experiments. The RELAP5 code was used to perform best estimate double-blind and single-blind predictions. The double-blind calculations are performed prior to the experiment and use specified nominal initial and boundary conditions. The single-blind calculations are performed after the experiment and use measured initial and boundary conditions while maintaining all other parameters constant, including the code version. Comparisons of calculated results with experimental results are discussed; the possible causes of discrepancies are explored and explained. RELAP5 calculated system pressure, mass inventory, and fuel cladding temperature agree reasonably well with the experiment results, and only slight changes are noted between the double-blind and single-blind predictions.

2272 **(EGG-M—17082) Statistical margin to DNB safety analysis approach for LOFT.** Atkinson, S.A. (EG and G Idaho, Inc., Idaho Falls (USA)). 1982. Contract AC07-76ID01570. 10p. (CONF-820802—38). NTIS, PC A02/MF A01. Order Number DE83000566.

From International meeting on thermal nuclear reactor safety; Chicago, IL, USA (29 Aug 1982).

A method was developed and used for LOFT thermal safety analysis to estimate the statistical margin to DNB for the hot rod, and to base safety analysis on desired DNB probability limits. This method is an advanced approach using response surface analysis methods, a very efficient experimental design, and a 2nd-order response surface equation with a 2nd-order error propagation analysis to define the MDNBR probability density function. Calculations for limiting transients were used in the response surface analysis thereby including transient interactions and trip uncertainties in the MDNBR probability density.

2273 **(EGG-M—17782) Existence of early core rewet during large-break LOCA transients in a commercial PWR.** Demmie, P.N. (EG and G Idaho, Inc., Idaho Falls (USA)). 1982. Contract AC07-76ID01570. 10p. (CONF-820802—30). NTIS, PC A02/MF A01. Order Number DE83000537.

From International meeting on thermal nuclear reactor safety; Chicago, IL, USA (29 Aug 1982).

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Large-break experiments in the Loss-of-Fluid Test (LOFT) Facility showed that the nuclear fuel rods were rewet between 5 and 10 s after break initiation. Computer calculations of large-break loss-of-coolant accident (LOCA) transients in a commercial pressurized water reactor (PWR) predict similar early core rewets if the primary coolant pumps remain powered. A question suggested by these experiments and calculations is, Can system conditions exist in a commercial PWR which would prevent an early core rewet during a large-break LOCA transient. A computer study answered this question in the affirmative for 200%, double-ended, cold-leg break LOCA transients in a PWR of the Westinghouse four-loop design. However, the probability of such an accident actually occurring is extremely small. This paper summarizes the results of this study and briefly discusses the implications of these results on nuclear safety issues.

2274 **(EGG-PHYS—6012) Validation of PBF figure of merit calculational techniques using non-calorimetric measured data.** Nigg, D.W. (Idaho National Engineering Lab., Idaho Falls (USA)). Aug 1982. Contract AC07-76ID01570. 46p. NTIS, PC A03/MF A01. Order Number DE83001142.

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The accuracy of the calculational techniques used for routine predictions of test fuel power levels in the PBF is investigated by comparing flux-wire activation and direct fission density measurements obtained during selected PBF experiments with corresponding calculated results generated using standard PBF reactor physics calculational models. It is concluded from the three tests examined that in some cases the standard calculational methods can tend to systematically overpredict test fuel powers by as much as, but in all probability no more than, approximately 12%.

2275 **(EPRI-NP—2080-Vol.1a) STEALTH: a Lagrange explicit finite difference code for solids, structural, and thermohydraulic analysis. Volume 1A: user's manual - theoretical background and numerical equations. Computer code manual.** Hofmann, R. (Science Applications, Inc., San Leandro, CA (USA)). Nov 1981. 442p. NTIS, PC A19/MF A01. Order Number DE83900191.

A useful computer simulation method based on the explicit finite difference technique can be used to address transient dynamic situations associated with nuclear reactor design and analysis. This volume is divided into two parts. Part A contains the theoretical background (physical and numerical) and the numerical equations for the STEALTH 1D, 2D, and 3D computer codes. Part B contains input instructions for all three codes. The STEALTH codes are based entirely on the published technology of the Lawrence Livermore National Laboratory, Livermore, California, and Sandia National Laboratories, Albuquerque, New Mexico.

2276 **(EPRI-NP—2080-Vol.1b) STEALTH: a Lagrange explicit finite difference code for solids, structural, and thermohydraulic analysis. Volume 1B: user's manual - input instructions. Computer code manual.** Hofmann, R. (Science Applications, Inc., San Leandro, CA (USA)). Nov 1981. 538p. NTIS, PC A23/MF A01. Order Number DE83900156.

A useful computer simulation method based on the explicit finite difference technique can be used to address transient dynamic situations associated with nuclear reactor design and analysis. This volume is divided into two parts. Part A contains the theoretical background (physical and numerical) and the numerical equations for the STEALTH 1D, 2D, and 3D computer codes. Part B contains input instructions for all three codes. The STEALTH codes are based entirely on the published technology of the Lawrence Livermore National Laboratory, Livermore, California, and Sandia National Laboratories, Albuquerque, New Mexico.

2277 **(EPRI-NP—2080-Vol.2) STEALTH: a Lagrange explicit finite difference code for solids, structural, and thermohydraulic analysis. Volume 2: sample and verification problems. Computer code manual.** Hofmann, R. (Science Applications, Inc., San Leandro, CA (USA)). Aug 1982. 492p. NTIS, PC A21/MF A01. Order Number DE83900190.

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STEALTH sample and verification problems are presented to help users become familiar with STEALTH capabilities, input, and output. Problems are grouped into articles which are completely self-contained. The pagination in each article is A.n, where A is a unique alphabetic-character article identifier and n is a sequential page number which starts from 1 on the first page of text for each article. Articles concerning new capabilities will be added as they become available. STEALTH sample and verification calculations are divided into the following general categories: transient mechanical calculations dealing with solids; transient mechanical calculations dealing with fluids; transient thermal calculations dealing with solids; transient thermal calculations dealing with fluids; static and quasi-static calculations; and complex boundary interaction calculations.

2278 **(EPRI-NP—2080-Vol.3) STEALTH: a Lagrange explicit finite difference code for solids, structural, and thermohydraulic analysis. Volume 3: programmer's manual. Computer code manual.** Hofmann, R. (Science Applications, Inc., San Leandro, CA (USA)). Nov 1981. 172p. NTIS, PC A08/MF A01. Order Number DE83900271.

This volume contains a description of a programming and documentation structure for the STEALTH finite difference computer programs based on general principles applicable to most large scientific computer programs. Program modularization (as well as documentation format) is based entirely on the theoretical elements of analysis of a physical system that were presented in Volume 1. FORTRAN programming and naming conventions are also described. Among the programming formats presented is a FORTRAN manual (Appendix FTN) which can be used as the basis for developing portable codes. STEALTH was developed on a CDC 7600. However, it has been designed so that it can be installed on

most large scientific computers. Installation documentation exists for some facilities and can be generated easily for others.

2279 **(EPRI-NP—2080-Vol.7) STEALTH: a Lagrange explicit finite difference code for solids, structural, and thermohydraulic analysis. Volume 7: implicit hydrodynamics. Computer code manual.** McKay, M.W. (Science Applications, Inc., La Jolla, CA (USA)). Jun 1982. 675p. NTIS, PC A99/MF A01. Order Number DE83900270.

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STEALTH is a family of computer codes that solve the equations of motion for a general continuum. These codes can be used to calculate a variety of physical processes in which the dynamic behavior of a continuum is involved. The versions of STEALTH described in this volume were designed for the calculation of problems involving low-speed fluid flow. They employ an implicit finite difference technique to solve the one- and two-dimensional equations of motion, written for an arbitrary coordinate system, for both incompressible and compressible fluids. The solution technique involves an iterative solution of the implicit, Lagrangian finite difference equations. Convection terms that result from the use of an arbitrarily-moving coordinate system are calculated separately. This volume provides the theoretical background, the finite difference equations, and the input instructions for the one- and two-dimensional codes; a discussion of several sample problems; and a listing of the input decks required to run those problems.

2280 **(EPRI-NP—2578) Two-phase performance of scale models of a primary coolant pump. Final report.** Kamath, P.S.; Swift, W.L. (Creare, Inc., Hanover, NH (USA)). Sep 1982. 164p. NTIS, PC A08/MF A01. Order Number DE83900265.

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Scale models of PWR primary coolant pumps were tested in steady and transient two-phase flows in order to generate a data base to aid in the development and assessment of pump performance models for use in computer codes for the analysis of postulated Loss-of-Coolant Accidents (LOCA). This report summarizes and unifies the single and two-phase air/water and steam/water performance data on the relatively high specific speed pumps [4200 rpm (US gpm) /sup 1/2//ft /sup 3/4/] tested in these programs. These data are compared with those acquired from tests on the lower specific speed Semiscale pump [926 rpm (US gpm)/sup 1/2// ft/sup 3/4/] to better understand the mechanism of performance degradation with increasing void fraction. The study revealed that scaling down the size of the pump while maintaining the same design specific speed produces very similar performance characteristics both in single and two-phase flows. Effects due to size and operating speed were not discernible within the range of test conditions and within experimental uncertainties. System pressure appears to affect the rate of degradation as a function of void fraction. The report includes a survey of the existing two-phase pump performance correlations. A correlation synthesized from the B and W, C-E and Creare two-phase data is also presented.

2281 **(EPRI-NP—2598) Effect of momentary loss of primary coolant on a developing natural circulation: partial simulation of the Ginna transient.** (SRI International, Menlo Park, CA (USA)). Sep 1982. 85p. NTIS, PC A05/MF A01. Order Number DE83900273.

A series of thermal-hydraulic experiments in a 1/30-scale PWR-like test facility was performed to assess the effect of momentary loss of primary coolant on a developing natural circulation. These experiments were prompted by some specific events recorded during the Ginna transient. The results of the experiments show that the transition from a forced circulation to a natural circulation is sufficiently resilient to withstand a momentary disruption caused by a partial loss of coolant followed by an immediate refill.

2282 **(EPRI-NP—2615) Natural-circulation experiments in a UTSG four-loop test facility. Interim report.** Jeuck, P.R. III; Kiang, R.L. (SRI International, Menlo Park, CA (USA)). Sep 1982. 54p. NTIS, PC A04/MF A01. Order Number DE83900275.

Additional experiments performed in the four-loop U-tube steam generator (UTSG) facility are described, including single-phase and two-phase natural-circulation tests. Results are included for over twenty experimental conditions including asymmetric cooling, hot and cold leg cold-water injection, noncondensible gas injection in the upper head, occasional two-phase natural circulation, continuous two-phase natural circulation, and reflux condensation.

2283 **(GA-A—16868) Effect of foundation embedment on the seismic response of a high temperature gas-cooled reactor plant.** Lee, T.H.; Thompson, R.W.; Charman, C.M. (General Atomic Co., San Diego, CA (USA)). Aug 1982. Contract AT03-76SF70046. 30p. (CONF-820873—1). NTIS, PC A03/MF A01. Order Number DE82021380.

From IAEA IWGGCR specialists' meeting on gas-cooled reactor seismic design problems and solutions; San Diego, CA, USA (30 Aug 1982).

The effects of soil-structure interaction during seismic events upon the dynamic response of a High Temperature Gas-Cooled Reactor Plant (HTGR) have been investigated for both surface-founded and embedded basemats. The influence from foundation embedment has been quantitatively assessed through a series of theoretical studies on plants of various sizes. The surface-founded analyses were performed using frequency-independent soil impedance parameters; while the embedded plant analyses utilized finite element models simulated on the FLUSH computer program. The seismic response of the surface-founded plants has been used to establish the standard-site design in-structure response spectra. These analyses were performed by using the linear modal formulation based on conventional soil stiffness and damping values. Numerical results are presented in terms of in-structure response spectra along with other pertinent seismic load data at key levels of the plant. Analysis techniques for future studies using viscoelastic halfspace representation and inelastic finite element modeling for soil are also discussed.

2284 **(GA-A—16869) HTGR core seismic analysis using an array processor.** Shatoff, H.; Charman, C.M. (General Atomic Co., San Diego, CA (USA)). Aug 1982. Contract AT03-76ET35301. 27p. (CONF-820873—2). NTIS, PC A03/MF A01. Order Number DE82021383.

From IAEA IWGGCR specialists' meeting on gas-cooled reactor seismic design problems and solutions; San Diego, CA, USA (30 Aug 1982).

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A Floating Point Systems array processor performs nonlinear dynamic analysis of the high-temperature gas-cooled reactor (HTGR) core with significant time and cost savings. The graphite HTGR core consists of approximately 8000 blocks of various shapes which are subject to motion and impact during a seismic event. Two-dimensional computer programs (CRUNCH2D, MCOCO) can perform explicit step-by-step dynamic analyses of up to 600 blocks for time-history motions. However, use of two-dimensional codes was limited by the large cost and run times required. Three-dimensional analysis of the entire core, or even a large part of it, had been considered totally impractical. Because of the needs of the HTGR core seismic program, a Floating Point Systems array processor was used to enhance computer performance of the two-dimensional core seismic computer programs, MCOCO and CRUNCH2D. These codes simulate the one-fifth-scale full-array HTGR core model. This paper compares the analysis with the test results for sine-sweep motion.

2285 **(GKSS—81/E/50) Total decommissioning of nuclear facilities.** Birkhold, U.; Obst, J.; Stasch, W.; Lettnin, H.; Zimmermann, W.; Stang, R. (GKSS-Forschungszentrum Geesthacht G.m.b.H., Geesthacht-Tesperhude (Germany, F.R.)). 1981. 13p. (In German). Dep. NTIS (US Sales Only), MF A01. Order Number DE82750562.

The following nuclear facilities in the Federal Republic of Germany are now ready for total decommissioning: the power plant Niederaichbach (KKN), the nuclear ship Otto Hahn and the research reactor FR2. Planning work on KKN commenced in 1979 and the approval procedure was begun in early 1980 when the approval contract was submitted. At the beginning of 1980 the contract for decommissioning the nuclear facilities on the Otto Hahn was awarded. Approval was received in December 1980 and work was begun on decommissioning the plant. FR2 is still in operation and will be shut down at the end of 1981. Planning work for de-

commissioning the nuclear part began at the end of 1980. The planning and the methods which are intended to be used for the three plants are described.

2286 **(GKSS—81/E/54) Performance of the containment code CORAN in Standard and Benchmark problems.** Schwan, H.; Hassan, A.M. (GKSS-Forschungszentrum Geesthacht G.m.b.H., Geesthacht-Tesperhude (Germany, F.R.). Inst. fuer Anlagentechnik). 1981. 36p. (In German). Dep. NTIS (US Sales Only), MF A01. Order Number DE82750535.

Codes for safety analyses have to be verified and qualified, which usually is done by comparison of calculated data against experimental data or known analytical solutions. For the containment code CORAN this is demonstrated by means of the German Containment-Standard Problems No. 1 and 2 and the CSNI-Numerical Benchmark Problem for containment-codes. The results indicate CORAN being a good tool for predicting the containment response due to loss of coolant accidents.

2287 **(GRS—29) Comparison of models describing cladding deformations during LOCA.** Chakraborty, A.K.; Zipper, R. (Gesellschaft fuer Reaktorsicherheit m.b.H. (GRS), Koeln (Germany, F.R.)). May 1981. 23p. (In German). Dep. NTIS (US Sales Only), MF A01. Order Number DE82750192.

This report compares the important models for the determination of cladding deformations during LOCA. In addition to the comparisons of underlying assumptions of different models the same is done for the coefficients applied for the models. In order to assess the predictive capability of the models the calculated results are compared with the experimental results of the individual claddings. It was found out that the results of temperature ramp tests could be calculated better than that of the pressure ramp tests. The calculations revealed that even with the simplified assumption of the model used in TESPA the agreement of the calculated results with those of model NORA was relatively good.

2288 **(HEDL-SA—2724-FP) PFR/TREAT C01 and L01 experiments.** Tylka, J.P.; Wright, A.E.; Pember, L.A.; Culley, G.C.; Davies, A.L.; Herbert, R.; Hill, D.J.; Woods, W.J.; Wood, M.H. (Argonne National Lab., IL (USA); Hanford Engineering Development Lab., Richland, WA (USA); UKAEA Atomic Energy Establishment, Winfrith; UKAEA Atomic Energy Research Establishment, Harwell). 1982. Contract AC06-76FF02170. 12p. (CONF-820704—29). NTIS, PC A02/MF A01. Order Number DE83000506.

From International topical meeting on LMFBR safety; Lyon, France (18 Jul 1982).

Portions of document are illegible.

The C01 and L01 TREAT experiments were the first two in a series of international fast reactor safety experiments to be conducted as part of the PFR/TREAT program being performed by the US and the UK. Conditions for these two experiments simulated a large fast reactor hypothetical 5$/second (150 ms period) transient overpower (TOP) accident. The C01 configuration was a single fuel pin in a NaK filled capsule while L01 used a seven-pin bundle in a flowing sodium loop. The fuel pins in both experiments had no prior irradiation and represented the PFR driver fuel. The C01 and L01 experiments were performed on November 5 and November 24, 1980, respectively. This paper describes the objectives, test articles, experimental approach, and the major observations. Post-transient examination results and fuel failure modeling studies are also presented.

2289 **(HEDL-SA—2725) PFR/TREAT programme: objectives, progress, and future work.** Culley, G.E. (Hanford Engineering Development Lab., Richland, WA (USA)). 9 Jun 1982. Contract AC06-76FF02170. 11p. (CONF-820704—30). NTIS, PC A02/MF A01. Order Number DE83000509.

From International topical meeting on LMFBR safety; Lyon, France (18 Jul 1982).

The PFR/TREAT collaborative programme of fast reactor fuel testing is described and the objectives are illustrated in terms of the parameters selected for the irradiation of US and UK full length fuel pins in PFR, followed by safety testing in TREAT. The measurements being made before, during and after testing are outlined and the equipment and facilities being used in the UK and USA are described. An outline is given of the progress made and results obtained since the beginning of the collaboration in November 1979, together with future schedules for irradiation and testing. More detailed results from the first two tests are given in a companion paper.

2290 **(HEDL-TME—75-98) Sodium-fire protection by space isolation, open catch pan and nitrogen flooding - FFTF Proof Test F5.** Boehmer, W.D.; Hilliard, R.K. (Hanford Engineering Development Lab., Richland, WA (USA)). Oct 1975. Contract AC06-76FF02170. 83p. NTIS, PC A05/MF A01. Order Number DE83000085.

Portions of document are illegible.

A large-scale sodium fire extinguishment test was performed to demonstrate the adequacy of the FFTF secondary sodium fire protection system. Twenty-three hundred pounds of sodium at 1100°F were spilled into an air filled cell which had a steel catch pan protecting the concrete floor and walls. The fire was self-extinguished when the oxygen in the relatively leak tight cell was consumed by sodium-oxygen reaction. Nitrogen flooding was started after 15 minutes to maintain an inert atmosphere during cooling. Only 5.7% of the sodium was reacted during the test. Approximately 100 lb. of water were released from the concrete, one tenth of which reacted to form hydrogen. It was concluded that all aspects of the test results were predictable and that the FFTF secondary sodium fire protection system was verified.

2291 **(INIS-mf—7011) Report on unusual incidents in nuclear power plants of the Federal Republic of Germany in 1980.** (Bundesministerium des Innern, Bonn (Germany, F.R.). Referat Oeffentlichkeitsarbeit). 11 Aug 1981. 30p. (In German). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82780771.

201 incidents are listed which are grouped in five categories. There were 5 incidents in category A (3%), 107 (53%) in category B, and 89 (44%) in category C. 133 incidents occured during normal operation (66%), 13 during start-up and shutdown (7%), and 55 (27%) during ontage revision, refuelling, or assembly. There was no hazard to the vicinity or to the nuclear power plant personnel.

2292 **(INIS-mf—7016) Investigation of the core melt accident in light water reactors.** Koerber, H. (Stuttgart Univ. (TH) (Germany, F.R.). Inst. fuer Kernenergetik und Energiesysteme). 21 Apr 1980. 352p. (In German). NTIS (US Sales Only), PC A16/MF A01. Order Number DE82780767.

Thesis.

In the thesis the core melt accident, heating up and collapsing of the reactor core were investigated. The most important parameters of influence were found and their effect on the development of the accident were shown. A causal diagram was developed representing the great number of events occurring in the course of the core melt accident as well as their mutual dependences. Models were developed and applied for a detailed description of the collapse process, melting of materials, heat and material transport at flow-off of the melted mass and for taking into account steam blocking in the destroyed core sections.

2293 **(INIS-mf—7034) Indemnification for nuclear damages - recent developments in the United States.** Shapar, H.K. (Nuclear Regulatory Commission, Washington, DC (USA)). (International Nuclear Law Association (INLA), Brussels (Belgium)). Oct 1981. 16p. (CONF-8109120—20). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82780778.

From Nuclear International Jura '81; Palma de Mallorca, Spain (27 Sep 1981).

Public liability for nuclear damages in the United States is dealt with by a Federal statutory system. The Price-Anderson Act provides a system of compensation for such damages with an overall limit of $560 million. This fund is composed of private insur-

ance, a utility assessment pool, and Federal government indemnity. The 1979 accident at the Three Mile Island nuclear station resulted in a less-than-full-scale test of the system. For the most part, the system has performed as intended although certain problems have been brought to light. Legislative proposal since the accident have focused on increasing the $560 million limitation on liability, but so far none of these proposals has been acted upon by the U.S. Congress. In the next several years, the Nuclear Regulatory Commission and possibly Congress will consider application of the Price-Anderson system to high-level waste facilities. The Commission must file with the Congress within two years a comprehensive report on the Price-Anderson Act, including recommendations for its continuation and amendment.

2294 (INIS-mf—7035) **New national legislation on compensation of nuclear damage.** de Guerra Machado Faria, N. (Comissao Nacional de Energia Nuclear de Brasil, Rio de Janeiro). (International Nuclear Law Association (INLA), Brussels (Belgium)). Oct 1981. 18p. (In French). (CONF-8109120—21). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82780779.

From Nuclear International Jura '81; Palma de Mallorca, Spain (27 Sep 1981).

This paper describes the nuclear third party liability system within the Brazilian legal framework. Following some considerations regarding the development of nuclear energy it then focuses on the relationship between accident prevention and third party liability and on the political administrative framework related to the nuclar industry in Brazil.

2295 (INIS-mf—7036) **New Swiss legislation on nuclear third party liability.** Fischer, U. (Motor-Columbus Ingenieurunternehmung A.G., Baden (Switzerland)). (International Nuclear Law Association (INLA), Brussels (Belgium)). Oct 1981. 25p. (In French). (CONF-8109120—22). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82780780.

From Nuclear International Jura '81; Palma de Mallorca, Spain (27 Sep 1981).

Following a description of the Paris Convention and Brussels Supplementary Convention system for nuclear third party liability and that prevailing until now in Switzerland, the paper reviews the new Swiss nuclear third party liability Bill prepared after a popular consultation. The new provisions are analysed and in particular, that providing for unlimited liability.

2296 (INIS-mf—7040) **New Trends in European Nuclear Liability Law.** Getz, H.; Steinkemper, M.H. (International Nuclear Law Association (INLA), Brussels (Belgium)). Oct 1981. 26p. (CONF-8109120—25). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82780783.

From Nuclear International Jura '81; Palma de Mallorca, Spain (27 Sep 1981).

This paper analyses recent developments in nuclear liability legislation in Europe. The first part deals with the planned revision of the Paris Convention and the Brussels Supplementary Convention; the second part focuses on the reforms envisaged in the field in Switzerland and in the Federal Republic of Germany, in particular concerning unlimited liability. Finally, the author concludes that national reform plans and work at international level are not opposed, but supplementary activities.

2297 (INIS-mf—7132, pp vp) **Research into nuclear safety problems by UJV.** Pernica, R.; Pfann, J. 1980. (In Czech). NTIS (US Sales Only), PC A09/MF A01.

From Nuclear Research Institute scientific and technical conference; Prague, Czechoslovakia (5 Jun 1980).

Research is discussed into WWER type reactor safety. A program was developed for the calculation of the core thermohydraulic conditions and a program for the calculation of transients. Reactor safety was assessed during a design-basis accident from the point of view of ECCS reliability. Attention was also devoted to the thermomechanical modelling of PWR fuel elements during states of operation and accident. (J.B.).

2298 (INIS-mf—7132, pp vp) **Assessment of PWR safety with regard to disturbances due to reactivity changes.** Pernica, R. 1980. (In Czech). NTIS (US Sales Only), PC A09/MF A01.

From Nuclear Research Institute scientific and technical conference; Prague, Czechoslovakia (5 Jun 1980).

The steady state method is briefly described for reactivity disturbances assessment using steady state calculations for two sets of reactivity coefficients and four values of the thermal conductivity of the gap. The variations were processed of the limit values of reactivity being applied with the thermal conductivity of the gap between the fuel and the can. All calculations were performed for a reactor with four core zones exposed to different radial thermal stresses with different fuel element proportional stresses. The results are shown in graphs. (J.B.).

2299 (INIS-mf—7132, pp vp) **Technical safety of reactor components.** Nechvatal, J.; Janik, L. 1980. (In Czech). NTIS (US Sales Only), PC A09/MF A01.

From Nuclear Research Institute scientific and technical conference; Prague, Czechoslovakia (5 Jun 1980).

Technical safety is discussed of WWER reactor components. The reliability analysis technique for the identification of defects is described. The mathematical modelling of the event tree is done using the Nonte Carlo method. Current criteria consider the probability of reactor component failure due to the effect of indeterminate and unstable propagation of initial cracks or crack-like defects. The main trends are shown of safeguarding WWER reactor safety and the importance is pointed out of standardization in the production of equipment, building, operation and maintenance of a nuclear power plant. (J.B.).

2300 (INIS-mf—7164) **Accident analysis in the water loop of the nuclear engineering department of IPEN using the RELAP4 code.** Fernandes Filho, T.L. (Instituto de Pesquisas Energeticas e Nucleares, Sao Paulo (Brazil)). Jun 1980. 199p. (In Portuguese). NTIS (US Sales Only), PC A09/MF A01. Order Number DE83780009.

Thesis.

A thermal-hydraulic analysis to describe the transient behavior in the water loop of the Nuclear Engineering Department of the Instituto de Pesquisas Energeticas e Nucleares, Sao Paulo, Brazil, was performed. Postulated accidents such as those resulting from (1) loss of coolant, (2) main pump failure and (3) power excursions, were studied. The computer code RELAP4/Mod.3 was employed as the principal tool of analysis.

2301 (Juel-Spez—124) **Investigation of reliability and failure probability for three types of a HTR depressurization system.** Schufmann, G. (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Inst. fuer Nukleare Sicherheitsforschung). Aug 1981. 20p. (In German). Dep. NTIS (US Sales Only), MF A01. Order Number DE82750526.

The depressurization system of the HTR primary circuit is intended to open at a nonpermissible pressure increase in order that the pressure may be reduced to a defined level. At normal operation the system must reliably remain closed. The properties safe opening at overpressure and safe sealing at normal operation are complementary in a certain respect. In this study reliability values are determined for both functions of the depressurization system for three different types. Subsequently the reliabilities are weighted.

2302 (KFK—3121) **Progress report on R + D activities in 1980 of the Institut fuer Material- und Festkoerperforschung.** (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Material- und Festkoerperforschung). Feb 1981. 44p. (In German). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82750584.

The activities of IMF in the following fields are discussed: 1) Project Schneller Brueter (core, cladding, and structural materials; safety analyses; instrumentation; core monitoring.) 2) Project Nukleare Sicherheit (fuel element behaviour during accidents; core meltdown) 3) Project Wiederaufarbeitung und Abfallbehandlung (reprocessing and waste treatment) 4) Fusion technology 5) Innovation research.

2303 (KFK—3154) NAUA-Mod 3 - A computer code for the description of the aerosol behaviour in a condensing atmosphere. Bunz, H.; Koyro, M.; Schoeck, W. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Projekt Nukleare Sicherheit). Sep 1981. 42p. (In German). Dep. NTIS (US Sales Only), MF A01. Order Number DE82750194.

This report gives a description of the computer code NAUA-Mod 3. Its purpose is to calculate the behaviour of a polydisperse aerosol system in the containment of a light water reactor after a postulated core meltdown accident as a function of the time. The most important effect being added to those already taken into account in comparable computer codes is the steam condensation onto the particles. In the report the equations taken as basis of the code are given and the physical processes they are derived from are explained. Another main objekt of the report is the description of the numerical methods used as well as the input and output of the code.

2304 (LA-UR—82-2805) Calculations of pressurized thermal shock problems with the SOLA-PTS method. Daly, B.J.; Kashiwa, B.A.; Torrey, M.D. (Los Alamos National Lab., NM (USA)). 1982. Contract W-7405-ENG-36. 19p. (CONF-821037—6). NTIS, PC A02/MF A01. Order Number DE83000609.

From 10. water reactor safety research information conference; Gaithersburg, MD, USA (12 Oct 1982).

A numerical procedure has been developed for multidimensional studies of detailed fluid-thermal mixing and wall heat transfer in the cold leg and downcomer of pressurized water reactors for application to the study of pressurized thermal shock. This method is briefly described and examples of its application to various test problems are presented to demonstrate its accuracy. An application of the method to the pressurized thermal shock problem is described for the case of a main steam line break.

2305 (LA-UR—82-2806) Hydrogen-migration modeling for the EPRI/HEDL standard problems. Travis, J.R. (Los Alamos National Lab., NM (USA)). 1982. Contract W-7405-ENG-36. 15p. (CONF-821037—5). NTIS, PC A02/MF A01. Order Number DE83000610.

From 10. water reactor safety research information conference; Gaithersburg, MD, USA (12 Oct 1982).

A numerical technique has been developed for calculating the full three-dimensional time-dependent Navier-Stokes equations with multiple species transport. The method is a modified form of the Implicit Continuous-fluid Eulerian (ICE) technique to solve the governing equations for low Mach number flows where pressure waves and local variations in compression and expansion are not significant. Large density variations, due to thermal and species concentration gradients, are accounted for without the restrictions of the classical Boussinesq approximation. Calculations of the EPRI/HEDL standard problems verify the feasibility of using this finite-difference technique for analyzing hydrogen dispersion within LWR containments.

2306 (LA-UR—82-2931) Respiratory protection at nuclear power plants. Reinert, B.D. (Los Alamos National Lab., NM (USA)). 1982. Contract W-7405-ENG-36. 9p. (CONF-821037—11). NTIS, PC A02/MF A01. Order Number DE83002063.

From 10. water reactor safety research information conference; Gaithersburg, MD, USA (12 Oct 1982).

Highlights of the respiratory protection research and development program conducted at Los Alamos is reviewed. (ACR)

2307 (LBL—14846) Effects of the accident at Three Mile Island on the mental health and behavior responses of the general population and the nuclear workers. Fabrikant, J.I. (Lawrence Berkeley Lab., CA (USA); California Univ., San Francisco (USA). Dept. of Radiology). Feb 1982. Contract AC03-76SF00098. 26p. (CONF-820265—1). NTIS, PC A03/MF A01. Order Number DE83000494.

From American Psychological Association mid-winter convention; Monterey, CA, USA (25 Feb 1982).

A main conclusion drawn from the investigation by the President's Commission was that the most serious health effect of the Three Mile Island nuclear accident was severe mental stress, which was short-lived. The highest levels of psychological distress were found among those living within 5 miles of Three Mile Island, in families with preschool children, and among the Three Mile Island nuclear workers. This report provides some understanding of how these conclusions were drawn, the methods used to obtain information of the experiences of mental stress and the behavioral effects and responses of the general population and the nuclear workers to the accident at Three Mile Island. In order to limit the scope of the discussion, information is taken from the Behavioral Effects Task Group Report [TMI79c] to the President's Commission, and thus from the labors of the many behavioral scientists.

2308 (MIT-EL—82-023) Simulation of sodium boiling experiments with THERMIT sodium version. Huh, K.Y. (Massachusetts Inst. of Tech., Cambridge (USA)). May 1982. Contract AM01-76EI02295. 179p. NTIS, PC A09/MF A01. Order Number DE82021227.

Thesis. Portions of document are illegible.

Natural and forced convection experiments (SBTF and French) are simulated with the sodium version of the thermal-hydraulic computer code THERMIT. Simulation is done for the test section with the pressure-velocity boundary condition and subsequently extended to the whole loop. For the test section simulation, a steady-state and transient calculations are performed and compared with experimental data. For the loop simulation, two methods are used, a simulated 1-D loop and an actual 1-D loop. In the simulated 1-D loop analysis, the vapor density is increased by one hundred and two hundred times to avoid the code failure and the results still showed some of the important characteristics of the two-phase flow oscillation in a loop. A mathematical model is suggested for the two-phase flow oscillation. In the actual 1-D loop, only the single phase calculation was performed and turned out to be nearly the same as the simulated 1-D loop single phase results.

2309 (NUREG—0090-V3-N2) Report to Congress on abnormal occurrences, April - June 1980. Quarterly report. (Nuclear Regulatory Commission, Washington, DC (USA). Office of Management and Program Analysis). Nov 1980. 39p. NTIS, PC A03/MF A01.

Section 208 of the Energy Reorganization Act of 1974 identifies an abnormal occurrence as an unscheduled incident or event which the Nuclear Regulatory Commission determines to be significant from the standpoint of public health or safety and requires a quarterly report of such events to be made to Congress. This report, the twenty-first in the series, covers the period April 1 to June 30, 1980. There were two abnormal occurrences at the nuclear power plants licensed to operate. One involved the loss of decay heat removal capability. The other involved the failure of control rods to insert fully during a scram. There were no abnormal occurrences at the fuel cycle facilities (other than nuclear power plants). There were no abnormal occurrences reported by the Agreement States.

2310 (NUREG—0909) NRC report on the January 25, 1982 steam generator tube rupture at R. E. Ginna nuclear power plant. Martin, T.T. (Nuclear Regulatory Commission, Washington, DC (USA)). Apr 1982. 328p. NTIS, PC A15/MF A01.

This NRC Task Force report documents the circumstances surrounding the January 25, 1982, steam generator tube rupture event at the R. E. Ginna Nuclear Power Plant. It focuses on the period from 9:25 A.M. on January 25, when the tube rupture occurred, to 10:45 A.M. on January 25, when the plant entered the recovery phase. Information outside this period is recounted as necessary to place the event in perspective. The report is intended to describe factual information and significant findings associated with the event and, thereby, provide the required data base for appropriate detailed analysis and recommendations by various NRC offices.

2311 **(NUREG/CR—2444-Vol.2) PWR FLECHT SEASET 21-rod bundle flow blockage task data and analysis report. NRC/EPRI/Westinghouse Report No. 11. Appendices K-P.** Loftus, M.J.; Hochreiter, L.E.; Lee, N.; McGuire, M.F.; Wenzel, A.H.; Valkovic, M.M. (Westinghouse Electric Corp., Pittsburgh, PA (USA). Nuclear Energy Systems Div.). Sep 1982. 910p. (EPRI-NP—2014-Vol.2; WCAP—9992-Vol.2). GPO $15.00.

This report presents data and limited analysis from the 21-Rod Bundle Flow Blockage Task of the Full-Length Emergency Cooling Heat Transfer Separate Effects and Systems Effects Test Program (FLECHT SEASET). The tests consisted of forced and gravity reflooding tests utilizing electrical heater rods with a cosine axial power profile to simulate PWR nuclear core fuel rod arrays. Steam cooling and hydraulic characteristics tests were also conducted. These tests were utilized to determine effects of various flow blockage configurations (shapes and distributions) on reflooding behavior, to aid in development/assessment of computational models in predicting reflooding behavior of flow blockage configurations, and to screen flow blockage configurations for future 163-rod flow blockage bundle tests.

2312 **(NUREG/CR—2603) Bubble behavior in LMFBR core disruptive accidents. Annual report Oct 80-Sep 81.** Reynolds, A.B.; Erdman, C.A.; Bradley, D.R.; Anderson, R.C.; Gold, M.R. (Virginia Univ., Charlottesville (USA). Dept. of Nuclear Engineering and Engineering Physics). Apr 1982. 89p. NTIS, PC A05/MF A01.

Research performed at the University of Virginia during FY '81 for the Advanced Reactor Safety Research Division of the U.S. Nuclear Regulatory Commission is reported. The research is part of the LMFBR Aerosol Release and Transport Program. Principal areas investigated were (1) analysis of ORNL FAST underwater tests, (2) pretest parametric analysis of ORNL under sodium tests, (3) axial motion of large expanding and collapsing bubbles, and (4) measurement of droplet sizes from flashing. Analysis of the FAST tests with the UVABUBL code showed the strong influence of water vapor during the bubble expansion; water vapor rapidly replaces UO2 vapor as the vapor that drives the bubble. In the case of the under sodium tests, it is expected that entrained sodium will vaporize and influence bubble behavior, but, unlike water, sodium will not be vaporized from the bubble surface. Earlier analyses of axial motion of the French EXCOBULLE experiments were improved. Experimental methods in the experiment on droplet sizes from flashing were developed further.

2313 **(NUREG/CR—2761) Results of vortex-suppressor tests, single-outlet sump tests and miscellaneous sensitivity tests. Containment sump reliability studies generic task A-43.** Padmanabhan, M. (Worcester Polytechnic Inst., Holden, MA (USA). Alden Research Lab.; Sandia National Labs., Albuquerque, NM (USA)). Sep 1982. Contract AC04-76DP00789. 112p. (ARL—49-82; SAND—82-7065). NTIS, PC A06/MF A01 - GPO $6.50. Order Number DE83000532.

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Full scale tests of flow conditions in Containment Recirculation Sumps for nuclear power stations were conducted at the Alden Research Laboratory (ARL) of Worcester Polytechnic Institute (WPI) to provide sump hydraulic design and performance data for use in resolving the Unresolved Safety Issue, A-43, Containment Sump Performance. This document is a report of the results of investigations conducted as a part of Phase II of the test program, including: (a) vortex suppressor tests to study in detail the hydraulic behavior of two commonly used suppressors; namely, cubic cage and horizontal floor grating; (b) single outlet sump tests to ascertain the hydraulic performance of single outlet sumps compared to double outlet sumps; and (c) tests to study the effects on the hydraulic performance of a solid partition wall in a double outlet sump, pump overspeed (i.e., higher flow), outlet pipe diameter, and bellmouth entrances.

2314 **(NUREG/CR—2787) Interim reliability evaluation program: analysis of the Arkansas Nuclear One. Unit 1 nuclear power plant. Volume 2 of 2.** Kolb, G.J. (Sandia National Labs., Albuquerque, NM (USA)). Jun 1982. Contract AC04-76DP00789. 1108p. (SAND—82-0978). NTIS, PC A99/MF A01. Order Number DE83000708.

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Appendices are presented concerning systemic event tree analysis; analysis of the ANO-1 front-line and support systems; high pressure injection/high pressure recirculation system; low pressure injection/low pressure recirculation system; core flood system; reactor building spray system; emergency feedwater system; reactor building cooling system; reactor protection system; power conversion system; engineered safeguards activation system; service water system; class 1E AC power system; 125 volt DC system; battery and switchgear emergency cooling system; emergency feedwater initiation and control system; human interface system; sequence quantification; and supporting calculations.

2315 **(NUREG/CR—2898) Reinforced concrete containment safety under hydrogen explosion loading.** Fardis, M.N.; Nacar, A.; Delichatsios, M.A. (Massachusetts Inst. of Tech., Cambridge (USA). Dept. of Civil Engineering). Sep 1982. 218p. GPO $7.50.

Portions of document are illegible.

In the present study the behavior and safety of a typical steel-lined reinforced concrete containment under postulated hydrogen explosions is investigated. The containment structure is that of the Indian Point, Unit 3, nuclear power plant, and consists of a cylinder capped with a hemispherical dome. The postulated explosions include both deflagrations and detonations. A deflagration produces a slow increase in pressure and temperature inside the containment. The pressure at the end of deflagration is, in first approximation, proportional to the predeflagration pressure and to the hydrogen volumetric concentration, and inversely proportional to the initial absolute temperature of the containment. The response to the quasistatic deflagration loading is computed by axisymmetric nonlinear Finite Element analysis.

2316 **(SAND—82-0980) Examination results on TMI-2 LPM charge converters YM-AMP-7023 and YM-AMP-7025.** Murphy, M.B.; Heintzleman, R.E. (Sandia National Labs., Albuquerque, NM (USA)). Sep 1982. Contract AC04-76DP00789. 28p. NTIS, PC A03/MF A01. Order Number DE83001661.

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During, and for several months after the Three Mile Island Unit 2 accident, the reactor vessel and two steam generators were closely monitored for the existence of coolant system loose parts. We have examined two Endevco charge converters removed from the loose parts monitoring system inside containment and found the devices to be severely degraded by gamma radiation. Because of this, it is likely that the loose parts readings made during the accident were lower than actual levels. This report discusses the cause of failure, our estimates of the total gamma radiation doses received by the charge converters, and our recommendations for changes in US Nuclear Regulatory Guide 1.133.

2317 **(SAND—82-1212A) Experimental results from combustion of hydrogen:air mixtures in an intermediate-scale tank.** Benedick, W.B.; Cummings, J.C.; Prassinos, P.G. (Sandia National Labs., Albuquerque, NM (USA)). 1982. Contract AC04-76DP00789. 15p. NTIS, PC A02/MF A01. Order Number DE83001266.

Portions of document are illegible.

Sandia National Laboratories is currently involved in several experimental projects to provide data that will help quantify the threat of hydrogen combustion during LWR accidents. One project which employs several experimental facilities is the Variable Geometry Experimental System (VGES). The purpose of this paper is to present a description of and experimental results from one of these facilities: an intermediate-scale burn tank ($\sim 5\ m^3$). The data provided by this facility can be used in the development of analytical models to predict hydrogen combustion behavior along with providing a means of assessing present and future analytical models.

2318 (SAND—82-1325C) Scaling considerations related to debris cooling. Gorham-Bergeron, E.D.; Lipinski, R.J. (Sandia National Labs., Albuquerque, NM (USA)). 1982. Contract AC04-76DP00789. 18p. (CONF-820962—3). NTIS, PC A02/MF A01. Order Number DE82022171.

From NRC/ANS meeting on basic thermal hydraulic mechanisms in LWR analysis; Bethesda, MD, USA (14 Sep 1982).

Portions of document are illegible.

The coolability of highly degraded LWR core debris depends on whether the particles are large or small, whether the debris is deep or shallow, and whether the system is at high or low pressure. Knowledge of the coolability behavior in each of these regimes, as well as the points of transition between regimes, is important for the proper extrapolation of small-scale experiments to full-scale reactor debris configurations. Specific coolability relations and transition points for these regimes are presented in this paper.

2319 (SAND—82-1969C) Applications of HECTR to reactor containments. Dingman, S.E.; Wester, M.J.; Camp, A.L. (Sandia National Labs., Albuquerque, NM (USA); Dikewood Corp., Albuquerque, NM (USA)). 1982. Contract AC04-76DP00789. 15p. (CONF-821026—8). NTIS, PC A02/MF A01. Order Number DE83000315.

From 2. international workshop on the impact of hydrogen on water reactor safety; Albuquerque, NM, USA (3 Oct 1982).

Portions of document are illegible.

This paper presents the results of calculations performed with HECTR, a computer program developed at Sandia National Laboratories to model nuclear plant containment responses to transients that include hydrogen burns. Calculations were performed for Grand Gulf, a Mark III boiling water reactor, and Sequoyah, a pressurized water reactor with ice condensers. The transients analyzed were for a stuck-open relief valve and a small break loss-of-coolant accident (LOCA). Failure of emergency core coolant injection was assumed for both transients, leading to the production of a significant amount of hydrogen. Both Grand Gulf and Sequoyah are equipped with deliberate hydrogen ignition systems which were designed to ignite hydrogen/air mixtures at low hydrogen concentrations; the intent is to subject the containment to lower peak pressures than would occur if larger concentrations accumulated and were accidently ignited. HECTR calculations were performed for both plants to determine the containment response to the transients including burns due to deliberate ignition.

2320 (SAND—82-2078C) Hydrogen behavior and control at light-water reactors during normal operations and during accidents. Kupiec, C.F.; Camp, A.L. (Sandia National Labs., Albuquerque, NM (USA)). 1982. Contract AC04-76DP00789. 13p. (CONF-821026—7). NTIS, PC A02/MF A01. Order Number DE83000312.

From 2. international workshop on the impact of hydrogen on water reactor safety; Albuquerque, NM, USA (3 Oct 1982).

The hydrogen manual which has been jointly prepared by Sandia National Laboratories and General Physics Corporation will become available early in 1983. This manual not only examines the theoretical aspects of hydrogen production, transport, mixing and mitigation, but also makes a strong effort to apply these principles to light water reactors. It is hoped that the manual will serve as a reference document for LWR design and operations personnel alike. Hydrogen behavior and control are closely examined for both normal operating conditions as well as postulated accident conditions at both Boiling Water Reactors (BWRs) and Pressurized Water Reactors (PWRs).

2321 (SAND—82-2120C) Containment-management study for severe PWR accidents. Haskin, F.E.; Behr, V.L.; Jung, J. (Sandia National Labs., Albuquerque, NM (USA)). 1982. Contract AC04-76DP00789. 3p. (CONF-821037—1). NTIS, PC A02/MF A01. Order Number DE82022196.

From 10. water reactor safety research information conference; Gaithersburg, MD, USA (12 Oct 1982).

This study involves detailed analyses of containment loadings (pressure-temperature histories) and thresholds for containment failure due to high pressure or temperature for specific PWRs. Containment loadings have been performed for the Zion plant and structural analyses have been conducted to estimate containment failure thresholds for the Watts Bar plant. A cooperative SASA effort has been initiated with Tennessee Valley Authority (TVA) for the Bellefonte plant. Zion and Bellefonte have large dry prestressed concrete containments. Watts Bar has a steel-shell, ice-condenser containment. Over the next two years, the plan is to complete containment management studies for Bellefonte and Watts Bar. A similar study for a subatmospheric containment may be performed.

2322 (SAND—82-2129C) High temperature fission product chemistry and transport in steam. Elrick, R.M.; Sallach, R.A. (Sandia National Labs., Albuquerque, NM (USA)). 1982. Contract AC04-76DP00789. 8p. (CONF-820802—37). NTIS, PC A02/MF A01. Order Number DE83000314.

From International meeting on thermal nuclear reactor safety; Chicago, IL, USA (29 Aug 1982).

Portions of document are illegible.

The High Temperature Fission Product Program, an experimental and analytical effort to produce thermodynamic and reaction-rate data on fission product species during severe LWR accidents, is reviewed. The paper discusses: (1) a facility where nonradioactive isotopes of fission products react with steam, reactor materials, and hydrogen for periods of time from seconds to hours at temperatures up to 1100°C; and (2) recent results of vapor phase studies with CsOH as well as CsI in a 304ss or Inconel 600 system with steam and hydrogen and, in the absence of steam and hydrogen, reactions of tellurium vapor with nickel, 304ss, Inconel 600, preoxidized 304ss, preoxidized Inconel 600 and silver, iodine vapor with silver, CsOH with iodine and with HI and CsI with Ag and with O_2.

2323 (SAND—82-2161C) Review of the Grand Gulf Hydrogen-Igniter System. Cummings, J.C.; Camp, A.L.; Sherman, M.P.; Wester, M.J.; Tomasko, D.; Byers, R.K.; Burnham, B.W. (Sandia National Labs., Albuquerque, NM (USA)). 1982. Contract AC04-76DP00789. 15p. (CONF-821026—6). NTIS, PC A02/MF A01. Order Number DE83000077.

From 2. international workshop on the impact of hydrogen on water reactor safety; Albuquerque, NM, USA (3 Oct 1982).

The Mississippi Power and Light Co. has proposed installation of the Hydrogen Igniter System (HIS) at Grand Gulf to burn the hydrogen generated during accidents more severe than the design-basis accidents. This paper reports on a NRC technical evaluation made of the adequacy of HIS to meet the threat posed by hydrogen combustion at Grand Gulf. It is judged that HIS is marginally adequate to meet the threat. Recommendations for changes to the proposed HIS design are discussed. (DLC)

2324 (SAND—82-2181C) Core-retention-concept assessment: alumina particle beds. Fish, J.D. (Sandia National Labs., Albuquerque, NM (USA)). 1982. Contract AC04-76DP00789. 3p. (CONF-821037—2-Summ.). NTIS, PC A02/MF A01. Order Number DE83000278.

From 10. water reactor safety research information conference; Gaithersburg, MD, USA (12 Oct 1982).

Nine tests of the particle-bed concept were conducted. The test bed was composed of thoria particles in two of the tests, alumina particles in six of the tests, and a combination of thoria and alumina in one test. Melts ranging from 2.8 kg to 25 kg were generated either by inductive heating of stainless steel slugs or by iron oxide/aluminum thermite reactions. In the former case, the melts were generated in place on top of the beds. In the latter case, the melts were dropped onto the beds from the reaction vessel. Two of the thermite tests involved sustained heating by inductive coupling to the iron phase of the melts. The thermite reaction produces a melt temperature of approximately 2700 K. With inductive heating at 1.0 W/g, melts were sustained at approximately 1700 K for up to several hours. Three of the tests, including one of the sustained thermite tests, were water cooled.

2325 (SAND—82-2182C) Fission product chemistry experiments at Sandia. Elrick, R.M.; Sallach, R.A.; Brockmann, J.E. (Sandia National Labs., Albuquerque, NM (USA)). 1982. Contract AC04-76DP00789. 14p. (CONF-821037—8). NTIS, PC A02/MF A01. Order Number DE83001183.

From 10. water reactor safety research information conference; Gaithersburg, MD, USA (12 Oct 1982).

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The High Temperature Fission Product Program, an experimental and analytical effort to produce thermodynamic and reaction-rate data on fission product species during severe LWR accidents, is reviewed. The paper discusses: (1) a facility where nonradioactive isotopes of fission products react with steam, reactor materials, and hydrogen for periods of time from seconds to hours at temperatures up to 1100°C; (2) the calibration of a laser Raman spectrometer for identifying chemical species at temperature; and (3) recent results of vapor phase studies with CsOH as well as CsI in a 304ss or Inconel 600 system with steam and hydrogen and, in the absence of steam and hydrogen, reactions of tellurium vapor with nickel, 304ss, Inconel 600, preoxidized 304ss, preoxidized Inconel 600 and silver, reaction of iodine vapor with silver, and reaction of CsOH with iodine and with HI and of CsI with Ag and with O_2.

2326 **(SAND—82-2183C) PLUGM: a coupled thermal-hydraulic computer model for freezing melt flow in a channel.** Pilch, M. (Sandia National Labs., Albuquerque, NM (USA)). 1982. Contract AC04-76DP00789. 11p. (CONF-821037—12). NTIS, PC A02/MF A01. Order Number DE83001172.

From 10. water reactor safety research information conference; Gaithersburg, MD, USA (12 Oct 1982).

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PLUGM is a coupled thermal-hydraulic computer model for freezing liquid flow and plugging in a cold channel. PLUGM is being developed at Sandia National Laboratories for applications in Sandia's ex-vessel Core Retention Concept Assessment Program and in Sandia's LMFBR Transition Phase Program. The purpose of this paper is to introduce PLUGM and demonstrate how it can be used in the analysis of two of the core retention concepts under investigation at Sandia: refractory brick crucibles and particle beds.

2327 **(SAND—82-2202C) Some aspects of statistical modeling of human-error probability.** Prairie, R.R. (Sandia National Labs., Albuquerque, NM (USA)). 1982. Contract AC04-76DP00789. 12p. (CONF-821021—2). NTIS, PC A02/MF A01. Order Number DE83001034.

From DOE statistical symposium; Idaho Falls, ID, USA (1 Oct 1982).

Human reliability analyses (HRA) are often performed as part of risk assessment and reliability projects. Recent events in nuclear power have shown the potential importance of the human element. There are several on-going efforts in the US and elsewhere with the purpose of modeling human error such that the human contribution can be incorporated into an overall risk assessment associated with one or more aspects of nuclear power. An effort that is described here uses the HRA (event tree) to quantify and model the human contribution to risk. As an example, risk analyses are being prepared on several nuclear power plants as part of the Interim Reliability Assessment Program (IREP). In this process the risk analyst selects the elements of his fault tree that could be contributed to by human error. He then solicits the HF analyst to do a HRA on this element.

2328 **(SAND—82-2269C) Recent results from the Sandia steam-explosion program.** Evans, N.A.; Mitchell, D.E.; Nelson, L.S.; Corradini, M.L. (Sandia National Labs., Albuquerque, NM (USA); Wisconsin Univ., Madison (USA)). 1982. Contract AC04-76DP00789. 25p. (CONF-821037—10). NTIS, PC A02/MF A01. Order Number DE83001169.

From 10. water reactor safety research information conference; Gaithersburg, MD, USA (12 Oct 1982).

The Sandia steam explosion program involves experiments at small and intermediate scale, and modelling and analysis, including estimates for the failure probability of the reactor pressure vessel and the containment building. Recent intermediate scale results show that molten corium A + R is as explosive as the molten simulant iron-alumina, with an average kinetic energy conversion ratio of approximately 2%. In addition, several iron-alumina tests produced rapidly sequential double steam explosions in which it appeared that the first explosion enhanced the coarse mixing process. Results at small scale indicate that the maximum pressure-volume product (the net work output) from the steam explosion of a single melt droplet increased four to five times for a ten-fold increase in ambient pressure. With the initial assumption that contact between molten core and coolant will produce a steam explosion, and futher assuming that such contact occurs in-vessel in the lower plenum, a Monte Carlo technique was used to calculate failure probabilities for a typical PWR.

2329 **(SAND—82-2285C) Hydrogen behavior and control program.** Cummings, J.C.; Berman, M. (Sandia National Labs., Albuquerque, NM (USA)). 1982. Contract AC04-76DP00789. 13p. (CONF-821037—9). NTIS, PC A02/MF A01. Order Number DE83001168.

From 10. water reactor safety research information conference; Gaithersburg, MD, USA (12 Oct 1982).

Portions of document are illegible.

Sandia National Laboratories is conducting a hydrogen research program for the Office of Research of the U.S. Nuclear Regulatory Commission. This program has two major objectives: assessment of the threat to nuclear power plants (containment structure, safety and control equipment, and the primary system) posed by hydrogen combustion; assessment of proposed hydrogen control and disposal methods; and development of new concepts.

2330 **(STUDSVIK-NR—82-82) Steam explosions in sodium cooled breeder reactors.** Lundell, B. (Studsvik Energiteknik AB, Nykoeping (Sweden)). Jan 1982. 18p. (In Swedish). (NE-TEKNIK—82-8). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702547.

Steam explosion is considered a physical process which transports heat from molten fuel to liquid coolant so fast that the coolant starts boiling in an explosion-like manner. The arising pressure waves transform part of the thermal energy to mechanical energy. This can stress the reactor tank and threaten its tightness. The course of the explosion has not been theoretically explained. Experimental results indicate that the probability of steam explosions in a breeder reactor is small. The efficiency of the transformation of the heat of fusion into mechanical energy in substantially lower than the theoretical maximum value. The mechanical stress from the steam explosion on the reactor tank does not seem to jeopardize its tightness.

2331 **Effect of debris bed pressure, particle size, and distribution on degraded nuclear reactor core coolability.** Squarer, D.; Pieczynski, A.T.; Hochreiter, L.E. (Westinghouse Electr Corp, Pittsburgh, Pa, USA). *Nuclear Science and Engineering;* **80**: No. 1, 2-13(Jan 1982).

In the worst hypothetical accident of a light water reactor (LWR), when all protection systems fail, the core could melt and be converted to a deep particulate bed as a result of molten-fuel-coolant interaction. The containment of such an accident depends on the coolability of the heat generating particulate bed. This paper summarizes published theoretical analyses that may predict bed dryout. In three of the analyses, the fluid flow in the heat generating particulate bed is considered to be laminar (Darcy's law), whereas in one study the fluid flow is solved for both the laminar and the turbulent flow regimes and is affected by capillary forces. 21 refs.

2332 **Coordinate transformation method for thermohydraulics in irregular three-dimensional geometries.** Agrawal, A.K.; Peckover, R.S. (UKAEA, Abingdon, Oxfs, Engl). *Nuclear Science and Engineering;* **80**: No. 1, 32-46(Jan 1982).

A method to solve the incompressible Navier-Stokes equations for irregular three-dimensional geometries is develóped. The method consists of two stages. The first stage involves a coordinate transformation that regularizes the awkwardly shaped surfaces into planar ones by suitably stretching or "ironing out" uneven surfaces. The boundary layers near the surface are resolved through the second stage involving another coordinate transformation such that only the boundary layers are broadened without substantially affecting the interior region. All of the basic mathematical formulations are given in this paper. 26 refs.

2333 **Contributions concerning quasi-steady propagation of thermal detonations through dispersions of hot liquid fuel in cooler volatile liquid coolants.** Condiff, D.W. (Argonne Natl Lab, ILL, USA). *International Journal of Heat and Mass Transfer;* **25**: No. 1, 87-98(Jan 1982).

The two-phase flow model of 1-dim. propagation of thermal detonation is reformulated to permit isolation of both new and existing conclusions which are independent of fragmentation kinetics data. The two-phase flow model is found to be necessary for making quantitive predictions of detonation strength in hydrodynamic fragmentation. A wide spectrum of kinetics-dependent permissible Chapman-Jouguet states is found possible for any specific initial condition in calculations for the UO/sub 2/-sodium system. 5 refs.

2334 **Analysis of temperature fluctuations in liquid-metal systems.** Meek, C.C.; Morris, M.J.; Doerner, R.C.; Hurt, R.F. (Argonne Natl Lab, Ill, USA). *Nuclear Science and Engineering;* **79**: No. 2, 202-211(Oct 1981).

A phenomenological model is developed to analyze temperature fluctuations in experiments that simulate various liquid-metal fast breeder reactor accident scenarios. Simplified mass, momentum, and energy equations are used to provide a unified system for analysis. Predictions of temperature autocovariance are compared with those observed during a representative in-pile sodium loop experiment. 11 refs.

2335 **Particle bed dryout model based on flooding.** Ostensen, R.W.; Lipinski, R.J. (Sandia Natl Lab, Albuquerque, NM, USA). *Nuclear Science and Engineering;* **79**: No. 1, 110-113(Sep 1981).

A model for particle bed dryout based on the phenomenon of flooding is developed for particles greater than approximately 1 mm in diameter. Dryout develops when vapor flow from boiling in the bed limits the influx of replenishing coolant. This paper presents a model based on a new criterion for dryout that predicts significantly different dryout behavior than previous models. 18 refs.

2336 **Is solar riskier than nuclear?.** Inhaber, H. (Oak Ridge Natl Lab, Tenn, USA). *Energy (Stamford, Connecticut);* **6**: No. 4, 18-19(1981).

Risk to human health has become one of the prime considerations in choosing energy systems, if it has not already overtaken economic cost. Accidents at reactors and collapses of dams all capture public attention. But are they the total risk of energy systems? Just as the cost of any article is made up of a number of sources, so the total risk of an energy system has many origins. The author lists these as: raw materials and fuel production, transportation (all applications), component fabrication, plant construction, operation and maintenance, waste disposition and deactivation and public health risk. While it is impossible to state with certainty that these sources of risk are the only ones, they are the major considerations in most risk studies. Most of these listed risk sources seem to be of non-catastrophic origin, i.e., accidents or illnesses that occur one at a time. Even for systems like nuclear power and hydroelectricity, which receive considerable publicity about real or potential catastrophies, the proportion of catastrophic (as meaured by historical statistics) to non-catastrophic risk is very small. As a result of the risk analysis philosophy described in this article, the author concludes that the risk in total man-days lost is least for energy from natural gas, next least from nuclear energy, greatest from coal, next greatest from oil, with all other sources between these limits.

2337 **Effect of burnup on the response of stainless steel-clad mixed-oxide fuels to simulated thermal transients.** Fenske, G.R.; Badyopadhyay, G. (Argonne Natl Lab, ILL, USA). *Journal of the American Ceramic Society;* **64**: No. 7, 375-382(1981).

Direct electrical heating experiments were performed on irradiated fuel to study the fuel and cladding response as a function of burnup during a slow thermal transient. The results indicated that the nature and extent of the fuel and cladding behavior depended on the quantity of fission gas retained in the fuel. Fission-gas-driven fuel ejection occurred as the molten cladding flowed down the stack exposing bare, radially unrestrained fuel. The fuel dispersion occurred in the absence of molten fuel and the amount of fuel ejected increased with increasing burnup. 31 refs.

2338 **(PB—82-196684) Pressure drop behaviour of the LOBI installation.** Ohlmer, E.; Schulze, W.; Schulz, R. (Commission of the European Communities, Luxembourg). [nd]. 39p. NTIS PC E03/MF E03.

It is important to obtain a detailed knowledge of the hydraulic behavior of an installation such as LOBI before it can be fully utilized. Previous measurements on this installation led to modification and, in any case, had insufficient resolution for a complete study. In the present study, attempts are made to improve the resolution. Techniques for pressure-drop measurement utilize mercury manometers while mass flow is estimated from calibrations of the steam generator outputs. The study allows the hydraulic behavior of the system and its components to be calculated with an uncertainty of about 5%.

2339 **(BMFT-FB-RS—179-Pt.1) Phase separation.** Mayinger, F. (Hannover Univ. (Germany, F.R.). Inst. fuer Verfahrenstechnik). [nd]. 228p. (In German). Dep. NTIS (US Sales Only) MF A01. Order Number DE82904404.

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A study is made of a phase separation model which also takes into account fluid carryover from a free horizontal surface during steam perfusion, and which can also describe processes during pressure relief as applied to emergency cooling in light-water nuclear reactors. 58 figures.

2340 **(INIS-mf—6975) State of risk comparisons of different types of energy generation.** Schuetz, B.; Bastl, W.; Stueger, R. (Gesellschaft fuer Reaktorsicherheit m.b.H. (GRS), Koeln (Germany, F.R.)). [nd]. 22p. (In German). (CONF-8110178—1). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82780762.

From 5. GRS-expert's conference on advances in safety evaluation of nuclear power plants; Munich, F.R. Germany (22 Oct 1981).

An overview of the risks of various modes of electrical power production is presented. The emphasis lies on the comparison between the nuclear energy and coal, whereby the supply- and disposal systems have been considered. Risk estimates of energy poduced by regenerative energy sources are particularly difficult, because either experience is lacking or systematic risk evaluations are in their preliminary state. An important problem is the correct balancing of the results obtained from risks due to normal operations and risks due to major accidents. Therefore, risk evaluations of one and the same electrical power production mode for finding of weak-points in the systems have gained a large practical significance.

2341 **(INIS-mf—6976) Cooperation of experts' opinion, experiment and computer code development. Loss-of-coolant as example.** Wolfert, K.; Hicken, E. (Gesellschaft fuer Reaktorsicherheit m.b.H. (GRS), Koeln (Germany, F.R.)). [nd]. 20p. (In German). (CONF-8110178—2). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82780763.

From 5. GRS-expert's conference on advances in safety evaluation of nuclear power plants; Munich, F.R. Germany (22 Oct 1981).

The connection between code development, code assessment and confidence in the analysis of transients will be discussed. In this manner, the major sources of errors in the codes and errors in applications of the codes will be shown. Standard problem results emphasize that, in order to have confidence in licensing statements, the codes must be physically realistic and the code user must be qualified and experienced. We will discuss why there is disagreement between the licensing authority and vendor concerning assessment of the fullfillment of safety goal requirements. The answer to the question lies in the different confidence levels of the assessment of transient analysis. It is expected that a decrease in the disagreement will result from an increased confidence level. Strong efforts will be made to increase this confidence level through improvements in the codes, experiments and related organizational strcutures. Because of the low probability for loss-of-coolant-accidents in the nuclear industry, assessment must rely on analytical techniques and experimental investigations.

2342 **(INIS-mf—6977) Results of transient analysis for light water reactors and methods evaluation by experiments, start-up tests out operation experiments.** Frisch, W.; Meissner, R. (Gesellschaft fuer Reaktorsicherheit m.b.H. (GRS), Koeln (Germany, F.R.)). [nd]. 35p. (In German). (CONF-8110178—6). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82780772.

From 5. GRS-expert's conference on advances in safety evaluation of nuclear power plants; Munich, F.R. Germany (22 Oct 1981).

Transients are defined as deviations from normal operation, not including initiating events with leaks in the main coolant system (loss of coolant accidents.) Transient analyses are carried out in both safety research and licensing. In safety research emphasis is put on accuracy of the analytical methods, while licensing analysis requires the proof that safety limits are no exceeded. In this paper some examples are given to demonstrate, how detailed the analyses have to be. The importance of verification of analytical methods by means of experiments and measurements at real plants is shown. The results can be summarized as follows: For transients relevant in licensing numerous experimental results and measurements in reactor plants are available to ensure proper model verification. For extreme but rare cases, which are considered in risk assessment studies (e.g. complete failure of important safety system functions), experimental verification of analytical methods is not complete. Uncertainties are taken into account by conservative estimates. In the near future additional experiments are planned (e.g. ATWS-cases in LOFT, valve tests for ATWS conditions) in order to improve model verification.

2343 **(INIS-mf—6978) Recent analysis of fission product behavior after a loss-of-coolant accident.** Lange, F.; Friedrichs, H.; Ullrich, W.; Hosemann, J.P. (Gesellschaft fuer Reaktorsicherheit m.b.H. (GRS), Koeln (Germany, F.R.)). [nd]. 22p. (In German). (CONF-8110178—3). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82780764.

From 5. GRS-expert's conference on advances in safety evaluation of nuclear power plants; Munich, F.R. Germany (22 Oct 1981).

The release of fission products from defective fuel rods in the course of a loss-of-coolant accident is discussed. It has to be distinguished between the short-term burst release and the long-term leaching of fission products after reflooding of the core. A model is presented which takes account of these two release modes and which quantifies the concentration of fission products in the containment atmosphere and in the sump water. The present state of knowledge of the different parameters of the model is discussed for the radiologically most significant iodine. Conservative parameter values are proposed which could be used in the licensing procedure.

2344 **(INIS-mf—6979) How to evaluate steam explosions in the light of recent knowledge - possibility, course and effect.** Mayinger, F. (Gesellschaft fuer Reaktorsicherheit m.b.H. (GRS), Koeln (Germany, F.R.)). [nd]. 25p. (In German). (CONF-8110178—4). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82780765.

From 5. GRS-expert's conference on advances in safety evaluation of nuclear power plants; Munich, F.R. Germany (22 Oct 1981).

Experimental and theoretical investigations performed in the last years and concerning the phenomenology and the effect of steam explosions allow a much more realistic estimation, whether and how the pressure vessel and the containment could be endangered by such an accident than this was possible at the time when the Rasmussen-study and the Deutsche Risikostudie - Phase A - were published. The status of knowledge and some simple physical deliberations with respect to the mechanical effect of a steam explosion are presented.

2345 **(EUR—6970-EN) Experimental data report on LOBI test A1-04.** Ohlmer, E.; Fortescue, T.; Kolar, W.; Eder, J. (Commission of the European Communities, Luxembourg). [nd]. 128p. NTIS PC E06/MF E06.

The LOBI (loop-blowdown-investigations) facility is a non-nuclear, high-pressure, integral test facility for loss-of-coolant experiments on safety research into water reactors (PWR). It is a two-loop test facility simulating the primary cooling system of a four-loop, 1300 MWe PWR. The influence of the loop components and of emergency core cooling systems on the blowdown course and on the heater-rod bundle temperature behavior is investigated. A description of the test method and boundary conditions for the test are given. A data aquisition system records the results on an anolog tape, which is processed giving a final digital tape containing fully corrected data in engineering units. Consistency checks and measurement uncertainties are discussed.

25 ENERGY STORAGE

2501 Magnetic

REFER ALSO TO CITATION(S) 2089

2502 Compressed Gas

REFER ALSO TO CITATION(S) 2357

2346 **(EPRI-EM—2351-Vol.3-Pt.2) Compressed-air energy storage: preliminary design and site-development program in an aquifer. Volume 3. Site-selection study - Part 2. Final report.** (Sargent and Lundy, Chicago, IL (USA); Public Service Co. of Indiana, Inc., Plainfield (USA)). Sep 1982. Contract AC02-78ET29232. 347p. NTIS, PC A15/MF A01. Order Number DE83001252.

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Volume 3, Parts 1 and 2, is part of a 9-volume study performed to investigate the behavior and suitability of an aquifer-based compressed air energy storage (CAES) facility. The study was jointly sponsored by the US Department of Energy and Electric Power Research Institute. Volume 3 covers the site selection study aspects of the project. Aquifer sites in the Illinois and Indiana portions of the Illinois Basin were identified and ranked. A site was selected from the four top-ranked sites and was then utilized in other project work as the host site for the preliminary design of a compressed air energy storage facility.

2347 **(PNL-SA—10076) Issues affecting storage of compressed air in solution-mined salt cavities.** Allen, R.D.; Doherty, T.J.; Thoms, R.L. (Pacific Northwest Lab., Richland, WA (USA)). Apr 1982. Contract AC06-76RL01830. 10p. (CONF-820814—35). NTIS, PC A02/MF A01. Order Number DE83002017.

From 17. Intersociety Energy Conversion Engineering conference; Los Angeles, CA, USA (8 Aug 1982).

Geologic factors affecting salt deposit acceptability for CAES include diameter, depth, thickness, mineralogy, strength, faulting, seismic susceptibility, caprock quality and rate of dissolution by ground water. Assessment of a site involves analysis of existing information, seismic surveying, exploratory drilling, salt and caprock examination, geophysical logging, in situ stress measurement, and determination of hydrologic impact. Geologic exploration and solution mining at Huntorf, Federal Republic of Germany, are discussed. Cavern design parameters include octahedral shear strength, excess lateral stress, depth to cavern top, lateral salt thickness, vertical salt thickness, span, and height-to-diameter ratio. Noncompensated cavern operation involves cycling with respect to temperature, pressure, humidity and water. Cavern, borehole and surface monitoring methods are discussed.

2348 **(PNL-SA—10166) Aquifer compressed-air field experiment at Pittsfield, Illinois.** Allen, R.D.; Doherty, T.J. (Pacific Northwest Lab., Richland, WA (USA)). Jun 1982. Contract AC06-76RL01830. 9p. (CONF-820969—2). NTIS, PC A02/MF A01. Order Number DE83002057.

From AIAA/EPRI international conference on UPH and compressed air energy storage; San Francisco, CA, USA (21 Sep 1982).

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Compressed air energy storage (CAES) is an electrical generation load-leveling technique. Air is stored within geologic reservoirs for use during peak demand. Aquifers can store natural gas economically and may be suitable for CAES, but differences in geochemistry, cycling period, temperature and viscosity must be evaluated. Geologic exploration has identified a test site near Pittsfield, Illinois. The reservoir is a gently inclined dome consisting of impervious dolomitic caprock overlying permeable sandstone. The closure is 200 m deep, about 200 m in radius, and 10 m thick. Water discovery pressure is near 1100 kPa. Air will be injected at near ambient temperature and relative humidity of about 5%. Cyclic injections will take place at 50°, 100°, 150° and 200°C, each set lasting three months. Temperature, pressure, liquid water content, relative humidity and withdrawn mineral particles will be monitored and analyzed to enable comparisons of reservoir behavior with numerical and experimental models. Pre- and post-test cores will be compared with respect to chemical composition, mineralogy, microstructure, and physical properties. Data from the field, laboratory, and numerical modeling studies will be integrated to develop comprehensive stability criteria for compressed air energy storage within aquifer type reservoirs.

2349 **(PNL-SA—10591) Underground energy-storage program overview.** Kannberg, L.D. (Pacific Northwest Lab., Richland, WA (USA)). Jul 1982. Contract AC06-76RL01830. 9p. (CONF-820827—28). NTIS, PC A02/MF A01. Order Number DE83002059.

From Energy storage contractors review meeting; Arlington, VA, USA (23 Aug 1982).

The objective of this program is to reduce technical and economic risks obstructing commercial development of underground energy storage concepts promising more effective and efficient utilization of energy resources. Primary concepts are Seasonal Thermal Energy Storage (STES) and Compressed Air Energy Storage (CAES). STES objectives include characterization and mitigation of STES concept technical deficiencies and uncertainties and evaluation of economic features. CAES objectives include development of stability criteria for CAES reservoirs and analysis and development of promising second-generation CAES systems. Characterization of the performance of TES systems at injection temperatures of less than 85°C is nearly complete. Studies of injection and storage at temperatures up to 150°C have been initiated and will be continued through FY 1983. Studies of nonaquifer STES systems including cavern and ice storage systems have been conducted and will continue in FY 1983. Stability criteria and guidelines documents have been published for salt and hard rock CAES reservoirs. All design and construction on the Pittsfield Aquifer Field Test will be completed by the end of FY 1982 and bubble development and air cycling will be conducted in the first six months of FY 1983. A preliminary screening of materials for use in thermal storage units of adiabatic and hybrid CAES systems has been completed. Two materials, Denstone (a registered product of the Norton Company) and Dresser basalt, survived screening tests and are recommended for additional long term testing.

2350 **(PNL-SA—10593) Reservoir-stability studies: porous-media analysis.** Doherty, T.J. (Pacific Northwest Lab., Richland, WA (USA)). Aug 1982. Contract AC06-76RL01830. 8p. (CONF-820827—26). NTIS, PC A02/MF A01. Order Number DE83002041.

From Energy storage contractors review meeting; Arlington, VA, USA (23 Aug 1982).

The Reservoir Stability Studies are based on the premise that long-term reservoir stability is the key technical issues impeding CAES implementation. The project's objective is to establish stability criteria and the accompanying technology base for large underground air storage reservoirs used for utility applications. Each of the three reservoir types (hard rock, salt, and aquifer) was the focus of a four-phase study effort consisting of a state-of-the-art survey resulting in preliminary criteria, a numerical modeling phase and an experimental phase to address CAES specific concerns, and a final field study phase, if required, to answer technical questions still remaining or to validate previous work. The preliminary criteria generated early in the project were both qualitative and quantitative guidelines. These criteria evolved through the course of the project as the research and development work was completed. The end product of the research performed on each reservoir type is a document of final stability criteria and guidelines. The generic numerical and experimental work in all three reservoir types were completed. Stability criteria for hard rock caverns and domal salt structures have been published. Aquifer studies have been completed through preliminary criteria generation, experimental and numerical studies, and development. Aquifer criteria should be published by March 1983.

2351 **Environmental concerns related to compressed air energy storage.** Stottlemyre, J.A. (Battelle Pacific Northwest Laboratories, Richland, WA); Craig, R.A. (U.S. Department of Energy, Div. of Environmental Control Technology, Washington, DC); Loscutoff, W.V. (U.S. Department of Energy, Div. of Energy Storage Systems, Washington, DC). pp 35.3-35.9 of Environmental aspects of non-conventional energy resources - II. Saint Clair, A.E. La Grange Park, IL; American Nuclear Society (1978).

From ANS meeting on environmental aspects of non-conventional energy resources; Denver, CO, USA (26 Sep 1978).

The paper briefly describes the technologies of compressed air energy storage (CAES) and notes the environmental factors which may be of concern in the implementation of these technologies. No attempt is made to quantify these environmental factors. In CAES, the compression and combustion phases of operation of the gas- or oil-fired turbine are separated. The environmental concerns are discussed relative to air impacts, water impacts, solid waste, impacts on geological structure, impacts due to noise, impacts on esthetic values and land use, and commitment of valuable resources. Also described is an ongoing research program designed to evaluate methods to control the effects of these environmental factors.

2506 Thermal

REFER ALSO TO CITATION(S) 2349

2352 **(AD-A—113355/2) Thermal energy storage in phase change material. Final scientific report 1 Feb 81-31 Jan 82.** White, P.; Buchlin, J-M. (Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium)). Mar 1982. 83p. NTIS, PC A05/MF A01.

The present study deals with an experimental investigation of low temperature thermal storage based on macroencapsulation of Phase Change Material (PCM). The storage performance capabilities of capsule bed, tube bank and tubular single-pass heat exchanger are compared. The tests are conducted on the VKI Solar Utility Network (SUN) which is a closed loop facility designed to study air heating systems. An original data acquisition chain based on two conversing microprocessors is developed to carry out mass flow, pressure drop and temperature measurements. The experimental results are interpreted on the basis of comparison with numerical predictions and they allow to draw the following conclusions. Each type of matrix has its own range of operation for practical application but from a heat transfer standpoint, the PCM capsule packing unit is strongly recommended. It is suggested to extend this investigation to the effect of Reynolds number to find optimum range for thermo-mechanical efficiency.

2353 **(BMFT-FB-T—81-145) Railway transport of low-temperature heat from large power stations by means of alternative heat carriers and water.** Luchtman, G.; Bracke, T. (Bundesministerium fuer Forschung und Technologie, Bonn (Germany, F.R.)). Nov 1981. 162p. (In German). NTIS (US Sales Only), PC A08/MF A01. Order Number DE82750637.

This report deals with the railway transport of liquid and solid heat carriers by means of tank waggons as an alternative to the pipe-line transport for small to middle heat loads. The typical characteristics of railway transport are analyzed and all essential technical and economic variables are recorded in a transport model. The data of over 1000 complex chemical compounds are evaluated from thermodynamical and processing engineering points of view in order to find a suitable heat carrier compound. Three ammonia compounds can be considered as promising for the railway heat transport, but due to the fact that complicated and expensive facili-

ties are needed for the heat transfer to and from ammonia compounds water is more suitable as heat carrier. The competitive position of the railway heat transport compared with other heat supply systems is found to be given for heat loads above 50-100 MJ/s and transport distances above 15-20 km.

2354 **(BMFT-FB-T—82-032) Development of an aquifer heat storage facility. Vol. 1.** Harasim, A.; Weissenbach, B. (Bundesministerium fuer Forschung und Technologie, Bonn (Germany, F.R.)). Mar 1982. 189p. (In German). NTIS (US Sales Only), PC A09/MF A01. Order Number DE82750557.

The concept of an near surface aquifer was developed to the state of project definition of a pilot plant. Several versions of construction have been drafted and the costs were calculated for variable site conditions. Aquifer heat storage facilities larger than 5.000 m^3 (water equivalent) are cheaper than present known storage concepts. Simultaneously to technical and economical investigations, problems of chemical mass transport in two typical soil materials, respectively in connection with calcareous gravel water and red marl water, were investigated in lab tests. Special attention was paid to the biological behaviour of a wet gravel bed in view of the possibility of clogging by slime. To these procedures recommendations are given to ensure safe operation of the storage plant. The corrosion in the storage facility was considered for various materials. The results show that cement made equipment has to be preferred. An area at the hospital in Munich-Grosshadern was selected as a location for the pilot plant, and a project definition was conducted including integration and later economical utilization of the aquifer storage. The works advanced to a state where essential new knowledges can only be gained by building a pilot plant.

2355 **(DFVLR-FB—81-32) Development of a dynamic working latent-heat-storage with Glauber's salt up to production stage.** Lindner, F.; Scheunemann, K. (Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt e.V., Koeln (Germany, F.R.)). 1981. 97p. (In German). NTIS (US Sales Only), PC A05/MF A01. Order Number DE82750541.

Printed as manuscript.

Starting from the operational tests of direct heat exchange at small Glauber's Salt-heat storages, the development of 2000 l modules up to production stage is stated. The principles of the latent heat storage are described and a comparison of static and dynamic storage is made. Essential points of the development are: Optimization of the supply systems, internal overflow, stability of cycles, self-nucleus formation, integration of the heat exchanger. Beyond that further storage media have been investigated. The stage product is presented and significant operational possibilities are shown.

2356 **(PB—82-188087) Thermochemical heat storage: state-of-the-art report.** Oelert, G.; Behret, H.; Friedel, W.; Hennemann, B.; Hodgett, D. (Statens Raad foer Byggnadsforskning, Stockholm (Sweden)). 1982. 164p. NTIS, PC A08/MF A01.

This report comprises the results of the chemical heat storage (TCHS) survey and assessment study assigned to Battelle-Institut e.V., Frankfurt, by the Swedish Council for Building Research (BFR) and the Swedish Board for Technical Development (STU). In accordance with the function of BFR and STU within the Energy R and D Program of the Swedish government, emphasis is given to energy use in buildings, but aspects of the industrial application of thermochemical heat storage are included as well. Technically, this study is restricted to TCHS systems of the type heat in yields thermochemical reaction yields heat out and excludes hydrogen technology, electrochemical and photochemical methods. Various applications are considered, covering the most important sectors of energy consumption in Sweden. The TCHS systems to be studied in this context are discontinuous sorption heat pump, chemical heat storage, chemical heat pipe, and continuous sorption heat pump.

2357 **(PNL-SA—10531) Evaluation of thermal-energy storage media for advanced compressed-air energy-storage systems.** Zaloudek, F.R.; Wheeler, K.R.; Marksberry, L. (Pacific Northwest Lab., Richland, WA (USA); FluiDyne Engineering Corp., Minneapolis, MN (USA)). 1982. Contract AC06-76RL01830. 8p. (CONF-820969—1). NTIS, PC A02/MF A01. Order Number DE83002058.

From AIAA/EPRI international conference on UPH and compressed air energy storage; San Francisco, CA, USA (21 Sep 1982).

Portions of document are illegible.

Proposed designs of adiabatic and hybrid compressed air energy storage (CAES) plants have utilized sensible heat storage systems to store the heat developed during the air compression phase of the operation cycle for subsequent use during the power generation phase. This study was performed to experimentally evaluate the performance and durability of several heat storage materials proposed for these systems. Materials considered were: (1) 3/8 in. sintered iron oxide pellets; (2) 1/2-in. Denstone spheres; (3) 1-in. cast iron alloy balls; and (4) crushed rock. The results indicated that, from the standpoint of performance and durability, Denstone, cast iron containing 27% or more chromium, or crushed rock (Dresser basalt) would be satisfactory. However, considering material costs in addition to performance and durability, crushed rock would probably be the most desirable heat storage material for these types of CAES plants.

2358 **(PNL-SA—10636) Analysis and assessment of STES technologies.** Brown, D.R.; Blahnik, D.E.; Huber, H.D. (Pacific Northwest Lab., Richland, WA (USA)). 1982. Contract AC06-76RL01830. 11p. (CONF-820827—25). NTIS, PC A02/MF A01. Order Number DE83002003.

From Energy storage contractors review meeting; Arlington, VA, USA (23 Aug 1982).

Portions of document are illegible.

This paper describes both technical and economic assessments undertaken in support of the Seasonal Thermal Energy Storage (STES) portion of the Underground Energy Storage Program. The FY 82 effort was comprised of four major activities: (1) completion of a detailed economic investigation of the cost of heat storage in aquifers; (2) documentation and preparation of a user's manual for AQUASTOR, a computer model for cost analysis of ATES coupled with district heating or cooling; (3) a combined technical and economic evaluation of several ice storage concepts; and (4) a detailed economic investigation of the cost of chill storage in aquifers.

2359 **(PB—82-190992) Investigation of latent heat storage materials in the medium and high temperature range.** Heine, D.; Heess, F.; Stiener, D.; Stuttgart, I.K.E. (Commission of the European Communities, Luxembourg). [nd]. 113p. NTIS, PC A05/MF A01.

Two temperature ranges were considered for latent heat storage systems based on inorganic salts. Structural materials and their corrosion resistance, chemical and physical properties of the salts, and economic criteria were considered. Because none of the structural materials tested were sufficiently corrosion-resistant between 700C and 900C, it is suggested that inhibitors or special alloys are needed. For temperatures between 200C and 450C, a chromium/molybdenum steel was considered suitable. The inorganic salts $MgCl_2$, NaCl, KF, and $MgCl_2$/NaCl were considered suitable. Work is continuing.

2508 Chemical

REFER ALSO TO CITATION(S) 2353, 2356, 2454

2509 Batteries

REFER ALSO TO CITATION(S) 2540, 2686

2360 **(AD-A—113603/5) Characterization of ether electrolytes for rechargeable lithium cells. Technical report.** Abraham, K.M.; Goldman, J.L.; Natwig, D.L. (EIC Labs., Inc., Newton, MA (USA)). Mar 1982. 34p. NTIS, PC A03/MF A01.

2Methyl-tetrahydrofuran (2Me-THF)/$LiAsF_6$ and several diethyl ether (DEE)/$LiAsF_6$-based electrolytes have been characterized for their usefulness in rechargeable Li/TiS_2 cells. This characterization has involved extended room temperature cell cycling at various depths of discharge, evaluation of rate/capacity behavior of cells at 25C and -10C, and storage of cells at 50C for up to one month with subsequent cycling. The thermal stability of the electrolytes at 71C was evaluated by storage experiments in sealed-tubes, followed by product analysis. The performance of 2Me-THF/$LiAsF_6$ cells far surpassed the others. The present data further substantiate previous reports from this laboratory of the superior behavior of 2Me-THF/$LiAsF_6$ solutions in rechargeable Li cells. The DEE/$LiAsF_6$ based electrolytes are too unstable thermally to be practically useful.

2361 **(AD-A—113604/3) The use of the reactive ether, tetrahydrofuran (THF) in rechargeable lithium cells. Technical report.** Abraham, K.M.; Goldman, J.L. (EIC Labs., Inc., Newton, MA (USA)). Apr 1982. 22p. NTIS, PC A02/MF A01.

The usefulness of tetrahydrofuran (THF) as a cosolvent with 2-methyltetrahydrofuran (2Me-THF)/$LiAsF_6$ for improving the low temperature rate capability of rechargeable Li cells has been explored. Li/TiS_2 cells utilizing 2Me-THF/$LiAsF_6$ blended with 15-50 volume-percent THF have shown substantially improved rate characteristics at 0 and -10C. In addition, the Li electrode in such cells has exhibited practically useful cycling efficiencies.

2362 **(BMFT-FB-T—82-030) Development of a nickel hydrogen cell with non-noble metal negative electrodes for stationary application and for electric vehicles.** Gutmann, G. (Bundesministerium fuer Forschung und Technologie, Bonn (Germany, F.R.)). 1982. 118p. (In German). NTIS (US Sales Only), PC A06/MF A01. Order Number DE82750555.

To demonstrate the feasibility of a concept developed to reduce Ni/H_2-cell production costs, ten 85 Ahr prototype cells have been built and tested. Ten electrode stacking units wired in parallel set up each cell stack, the stacking units consisting of one advanced technology, Ni00H-electrode 4.2 mm thick with 0.12 Ahr/cm^2 capacity per unit area, two 0.2 mm asbestos separators, and two 0.6 mm Siemens-Raneynickel hydrogen electrodes of the supported structure fuel-cell type with reduced catalyst loading of 50 mg/cm^2. The cell can is made of AISI 304 stainless steel, the deep drawn end caps bearing gas tight terminals with PTFE compression seals. From the 2.1 kg/2.0 l single cells measured at 25°Cm the following data have been obtained: discharge time/h = 5; mid discharge voltage/V = 1,28; Wh/kg = 50-53; W/kg = 10; C/C_6 = 1; discharge time/h = 2; mid discharge voltage/V = 1.25; Wh/kg = 48-50; W/kg = 24; C/C_6 = 0.97; discharge time/h = 1; mid discharge voltage/V = 1,20; Wh/kg = 44-47; W/kg = 46; C/C_6 = 0.95; discharge time/h = 0.5; mid discharge voltage/V = 1.12; Wh/kg = 41-43; W/kg = 86; C/C_6 = 0.94. The maximum power is limited to 100-110 W/kg, self discharge showed to be 15% for the first day and 4% per day for the following period.

2363 **(ORNL/TM—8489) Physical chemistry of molten-salt batteries. Final report, 1 October 1980-September 1981. Current-induced composition gradients in molten LiCl-KCl.** Vallet, C.E.; Heatherly, D.E.; Braunstein, J. (Oak Ridge National Lab., TN (USA)). Oct 1982. Contract W-7405-ENG-26. 20p. NTIS, PC A02/MF A01. Order Number DE83001684.

Current-induced composition gradients have been predicted in mixed molten salt battery electrolytes. Composition shifts, if large enough, can produce significant deleterious effects, such as solid phase precipitation in or near the electrodes of molten salt batteries, including the LiAl/LiCl-KCl/FeS/sub x/ battery. Quantitative measurements are needed to determine the extent of the gradients and to find means to reduce them. This report presents the first quantitative SEM/EDX measurements with high distance resolution (<50 μm) of the shape of the composition profile in LiCl-KCl electrolyzed between LiAl electrodes. Also, current-induced precipitation of LiCl in a porous LiAl anode is indicated by SEM/EDX examination. The measured compositions are consistent with predictions from mass transport models based on the electrode reactions, migrational and diffusional mobilities. 5 figures, 4 tables.

2364 **(UCRL—15481) Electrochemical properties of alloys of aluminum with gallium and phosphorus. Final report, 1981/1982.** (Belgrade Univ. (Yugoslavia)). Jun 1982. Contract W-7405-ENG-48. 149p. NTIS, PC A07/MF A01. Order Number DE83000599.

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This project is directed toward mastering the method of obtaining GAPAL (gallium-phosphorus alloy of aluminum) sheets 2 to 8 mm thick in a reproducible manner possessing electrochemical properties acceptable for the use in ALAIR (aluminum-air) batteries. The specific program designed for the research period of 1 year was as follows: (1) a number of alloy samples were to be made from high-purity aluminum (99.999%) in the form of blocks 50 x 50 x 5 mm by splat-cooling from the melt, so as to cover a range of gallium and phosphorus contents; (2) the samples were to be submitted to the full range of electrochemical investigations; (3) the composition exhibiting most favorable characteristics (largest quality number) was to be submitted to the metallurgical characterization; (4) technical grade aluminum (99.5 and 99.8%) was to be collected from different sources and submitted to impurity analysis with the tendency to obtain the base metal in a spectrum of impurity contents; (5) the alloy of the most favorable composition was to be made in a number of samples using different base metals; and (6) electrochemical and metallographic investigations were to be carried out in order to learn about the effect of impurities on the characteristics of the alloy. Results are presented and discussed. (WHK)

2365 **Evaluation of nickel for positive electrode components in LIAL/FES cells.** Smaga, J.A.; Battles, J.E. (Argonne Natl Lab, Ill, USA). *Journal of the Electrochemical Society;* **129**: No. 3, 496-502(Mar 1982).

The materials used for current collector applications in lithium-aluminum/iron sulfide batteries must combine the qualities of corrosion resistance, low resistivity, and ease of formability to maximize battery lifetime and performance. An extensive program of materials evaluation is being conducted to identify the optimum materials. As part of this program, the corrosion resistance of nickel positive electrode components (i.e., collectors, electrode frames, and retaining screens) was evaluated in seven test cells. The effects of (i) length of operation, (ii) charge cutoff voltage, (iii) additives for improved cell performance, and (iv) assembled state of charge were determined. Corrosion behavior was found to be very dependent on the last parameter. An iron deposition layer 4-6 /mu/m thick formed on the nickel components of cells assembled in the fully charged state. The nickel components from four cells built in a semicharged condition exhibited localized areas of severe intergranular attack. 14 refs.

2366 **Method of nickel electrode production.** Fritts, D.H.; Leonard, J.F. (to Department of the Air Force, Washington, DC (USA)). US Patent Application 6,333,216. Dec 1981. Filed date 21 Dec 1981. 17p.

A method for preparing nickel electrodes is provided in which zinc hydroxide is deposited onto a metal plaque simultaneously with nickel hydroxide. A nickel electrode so prepared exhibits improved dimensional stability.

2367 **Lithium-aluminum/iron sulfide batteries.** Vissers, D.R. (Argonne National Lab., IL). pp 47-90 of Materials for advanced batteries. Murphy, D.W.; Broudhead, J.; Steele, B.C.H. (eds.). New York, NY; Plenum Publishing Corporation (1979).

High-temperature rechargeable batteries are under development for electric-vehicle propulsion and for stationary energy-storage applications. These cells utilize a molten salt electrolyte such as LiCl-KCl eutectic (mp, 352°C), negative electrodes of either Li-Si or Li-Al alloy, and positive electrodes of either FeS or FeS_2. Over the past seven years, several hundred engineering cells with differ-

ent designs have been tested, some of which have achieved specific energies of >100 W-hr/kg and specific powers of >80 W/kg at 50% depth of discharge, other cells have operated for >1000 cycles. During 1979, Eagle-Picher Industries completed fabrication of the first full-scale (40 kW-hr) Li/MS battery, which consisted of two 20 kW-hr modules (60 cells each) housed in a thermally insulated case. Testing of this battery has been indefinitely delayed due to the unexpected short-circuit of one of the modules during heat up. The fabrication of other full-scale batteries is planned in the coming years.

2368 **(PB—82-200098) Solid fluoridated electrolytes. Final report.** Lucas, J.; Poulain, M.; Matecki, M.; Plannetier, J. (Commission of the European Communities, Luxembourg). [nd]. 44p. NTIS, PC A03/MF A01.

The optimization of three kinds of solid fluorides for possible use as solid electrolytes was studied. They were: a molecular solid, stannous fluoride (SnF_2), non-stoichiometric fluorides MF_2+x. Investigations of ZrF_4-oxide or ZrF_4-fluoride systems, and fluorozicronate glasses.

29 ENERGY PLANNING AND POLICY

REFER ALSO TO CITATION(S) 3867

2901 Energy Analysis And Modeling

REFER ALSO TO CITATION(S) 2213, 3872

2369 **(DOE/CS/65004—T1) Urban energy strategies for the eighties: a self-help guide for local decision-makers.** (Cooper Union Research Foundation, New York (USA)). Jun 1982. Contract FG01-80CS65004. 70p. NTIS, PC A04/MF A01. Order Number DE83000153.

This report, while cognizant of the differences in loal energy situations around the country, sets forth broadly-defined strategies and recommendations for action. Local policy-makers can select and refine these strategies so as to suit the particular needs of their communities. Issues discussed are: financing local projects; energy supply and production; energy to spur economic development in low-income communities; relations with utility companies; energy office and its role; energy data base and the planning process; non-financial incentives to promote energy efficiency; contingency planning for energy emergencies; and energy and transportation. (PSB)

2370 **(DOE/PE/02835—T1) Imperfect competition in the international energy market: a computerized Nash-Cournot model.** Salant, S.W. (ICF, Inc., Washington, DC (USA)). May 1979. Contract AC01-78PE02835. 243p. NTIS, PC A11/MF A01. Order Number DE83000838.

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This report describes two computerized models of the international energy market. Price and extraction paths for major energy resources are forecasted as the equilibrium solution to a Nash non-cooperative, non-zero-sum differential game. Appendices deal with: existence of equilibrium; uniqueness of equilibrium and convergence of algorithms; impact of reduced US demand upon world oil prices; marginal-cost curves for world resources in oil, gas, and coal; specification of demand system; and program listings of single and multi-product models. (PSB)

2371 **(IKE—4-103) Development of a computer model (REASON) for the simulation of behavioural decisions on the basis of inference and valuation processes.** Engemann, A.; Radtke, M.; Sachs, S. (Stuttgart Univ. (TH) (Germany, F.R.). Inst. fuer Kernenergetik und Energiesysteme). Jul 1981. 79p. (In German). Dep. NTIS (US Sales Only), MF A01. Order Number DE82750195.

A computer model for the simulation of behavioural decisions and the preceding inference and valuation processes is under development under the sponsorship of the 'Stiftung Volkswagenwerk'. The present paper describes the basic ideas of the model from both the psychological and the mathematical point of view. The interdisciplinary character of the project is demonstrated quite clearly. In a semantic network, which contains knowlege, values and standards related to the field under consideration, feasible actions and their consequences are evaluated. According to the behavioural model of Ajzen and Fishbein, valuations of the consequences are multiplied with the expections and added up. The command language for the program allows an algebraic definition of the Fishbein formula. The concept, consisting of object structures, predicates and implications, can be described in nearly natural language. In addition to this 'expected utility model' the program provides the possibility to exclude option by thresholds for the simulation of simplistic heuristics.

2372 **(NZERDC—78) Energy-pricing policies in New Zealand.** Low, R.E.; Read, P.L. (New Zealand Energy Research and Development Committee, Auckland). Apr 1982. 231p. NTIS (US Sales Only), PC A11/MF A01. Order Number DE83900210.

This study surveyed actual pricing practice and attitudes towards pricing policy in the energy sector. Secrecy of industrial practices thwarted much data collection but alternative data was secured through executive interviews. The report is aimed toward a broad audience including non-professionals and contains explanatory notes for economic analysis. Recommendations are presented for fifteen areas with certain of these indicated for further study. (PBS)

2373 **(ORNL/TM—8177) Existence and uniqueness of solutions from the LEAP equilibrium energy-economy model.** Oblow, E.M. (Oak Ridge National Lab., TN (USA)). Oct 1982. Contract W-7405-ENG-26. 36p. NTIS, PC A03/MF A01. Order Number DE83001675.

A study was made of the existence and uniqueness of solutions to the long-range, energy-economy model LEAP. The code is a large scale, long-range (50 year) equilibrium model of energy supply and demand in the US economy used for government and industrial forecasting. The study focused on the two features which distinguish LEAP from other equilibrium models - the treatment of product allocation and basic conversion of materials into an energy end product. Both allocation and conversion processes are modeled in a behavioral fashion which differs from classical economic paradigms. The results of the study indicate that while LEAP contains desirable behavioral features, these same features can give rise to non-uniqueness in the solution of allocation and conversion process equations. Conditions under which existence and uniqueness of solutions might not occur are developed in detail and their impact in practical applications are discussed.

2374 **(ORNL/TM—8178) Evaluation of the mathematical and economic basis for conversion processes in the LEAP energy-economy model.** Oblow, E.M. (Oak Ridge National Lab., TN (USA)). Oct 1982. Contract W-7405-ENG-26. 31p. NTIS, PC A03/MF A01. Order Number DE83001706.

An evaluation was made of the mathematical and economic basis for conversion processes in the LEAP energy-economy model. Conversion processes are the main modeling subunit in LEAP used to represent energy conversion industries and are supposedly based on the classical economic theory of the firm. The study arose out of questions about uniqueness and existence of LEAP solutions and their relation to classical equilibrium economic theory. An analysis of classical theory and LEAP model equations was made to determine their exact relationship. The conclusions drawn from this analysis were that LEAP theory is not consistent with the classical theory of the firm. Specifically, the capacity factor formalism used by LEAP does not support a classical interpretation in terms of a technological production function for energy conversion processes. The economic implications of this inconsistency are suboptimal process operation and short term negative profits in years where plant operation should be terminated. A new capacity factor formalism, which retains the behavioral features of the original model, is proposed to resolve these discrepancies.

2375 **MARKAL: a linear-programming model for energy-systems analysis: technical description of the BNL version.** Fishbone, L.G.; Abilock, H. (Brookhaven Natl Lab, Upton, NY, USA). *International Journal of Energy Research;* 5: No. 4, 353-375(Oct-Dec 1981).

As part of a project to assess the value of new energy technologies, an international group of researchers created a linear-programming model of national energy systems. This model, MARKAL, is driven by useful energy demands, optimizes over several time periods collectively, and allows multiobjective analyses to be performed quite easily. The authors describe here the technical structure of the model, defining the functions determined when satisfying the model's relations, and the parameters that must be supplied to give the model content. 39 refs.

2376 **(PB—82-199167) Preliminary case studies of economy and energy profiles for Ireland during 1979-1990. Final report.** Henry, E.W. (Commission of the European Communities, Luxembourg). [nd]. 89p. NTIS PC E05/MF E05.

Illustrated is the complete follow-through from the input/output model EXPLOR to the energy demand model (EDM) and the energy flow optimization model (EFOM). The results of the 1985 case study for Ireland have been optimized by means of the EFOM model and software. Optimal final energy flows are compared with the non-optimum initial flows using the minimal total cost of energy supply as the criterion. Six economic profiles for the years 1980 and 1985 are compared with 1974 figures, and EDM results by fuel type and demand vector are considered. The methodology involved in updating and projecting EURECA (European energy consumption analysis) Ireland data based on thirteen exogenous variables is described.

2377 **(PB—82-200221) EC energy modelling programme. Final report.** Brascamp, M.H. (Commission of the European Communities, Luxembourg). [nd]. 58p. NTIS PC E04/MF E04.

The Dutch energy situation, the energy policy and its consequences are described. It is shown that in the government's view the energy problem is essentially a long-term problem. However, as it has to be tackled now, medium-term problems in the field of energy, economy and environment need to be considered. In consequence, the EC medium-term energy model is examined. The theoretical weakness of the econometric demand model is demonstrated, and its ability to tackle medium-term problems is thought to be inadequate.

2902 Economics And Sociology

REFER ALSO TO CITATION(S) 1846, 2371, 2374, 2420, 2429, 2433

2378 **(CONF-8110237—1) Some non-urban aspects of Southern Appalachian rural nonfarm population.** Newman, B.G. (Oak Ridge National Lab., TN (USA)). 1981. Contract W-7405-ENG-26. 15p. NTIS, PC A02/MF A01. Order Number DE83001886.

From Appliachian Geographers conference; Pipestem, WV, USA (2 Oct 1981).

From a study encompassing eleven New York counties it was concluded that the Southern Appalachian rural nonfarm population is older than the US rural nonfarm population as a whole. Most of the rural nonfarm persons interviewed were not employed fulltime. Workers tended to be in positions of marginal employment. Generally, with increasing distance from an urban center, the rural nonfarm people are older, in more marginal employment positions and less likely to have any association with any urban area except to travel there for medical reasons. (PSB)

2379 **Financial constraints of the development of solar energy: and suggested government action to mitigate such constraints.** Corey, G.R. (Commonwealth Edison Co, Chicago, IL). *Energy (Oxford);* 7: No. 1, 87-97(Jan 1982).

Solar-energy applications can be separated into six categories: (A) retrofit of existing buildings, (B) altered structural designs for new buildings, (C) solar collectors for low-temperature water and space heating, (D) relatively small on-site solar generators (including windmills), (E) large-scale solar or wind-powered electric generator or cogenerator installations, and (F) widespread dispersion of solar generation with an integrated electric-supply sytem. Decisions to opt for solar applications in the first three categories are largely made by individual homeowners, landlords, small-business entrepreneurs, and corporation executives, while the development and installation of facilities in the last three categories are clearly affected by the financial and regulatory constraints and incentives faced by local energy-supply utilities, especially electric utilities. Government actions to stimulate solar development are different for the first three categories than for the last three. If electric utilities are to be induced to install solar-generation facilities, existing rate-making practices must be revised. Several additional federal actions might be taken to provide utilities and others, including large industrial power users, with economic incentives to install solar and wind power generation. 2 refs.

2380 **Looking towards the future, building on the past: developing new energy sources.** Malinowski, J.H.; Kubitz, K.R. (Pacific Gas and Electric Co., San Francisco, CA). *ASSET (Abstracts of Selected Solar Energy Technology);* 3: No. 7, 40-44(Jul 1981).

From United Nations Conference on New and Renewable Sources of Energy; Nariobi, Kenya (10 Aug 1981).

The Pacific Gas and Electric Company (PGE), one of the largest energy utlities in the USA, is also one of the leading utilities in evolving an energy-supply system that responds to the changing world economics of energy. It has done so by building on a long tradition of developing renewable and economical energy resources. Some of these resources include energy from conservation sources, geothermal energy, cogeneration, and the developing technologies of wind and solar generation. The future looks promising for both PGE and the new and renewable energy technologies which are being developed.

2381 **(NP—3900009) Acquisition decisions for energy conservation: do tax credits influence company investment.** Pitts, R.E.; Wittenbach, J.L. (Mississippi Univ., University (USA); Notre Dame Univ., IN (USA)). [nd]. 25p. Univ. of Mississippi, University, MS.

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The advantages and disadvantages of tax credits are discussed and the properties eligible for the energy tax credit are explained briefly. The findings of a survey of major firms designed to measure the effectiveness of the tax credits as a means of stimulating energy conservation by business are reported.

2903 Environment, Health, And Safety

REFER ALSO TO CITATION(S) 1582, 1583, 1649, 2415, 2958, 2973, 2985, 2994, 3034

2382 (CERN—82-02, pp 147-162) **Radiological impact of the future CERN program (LEP).** Goebel, K. (European Organization for Nuclear Research, Geneva (Switzerland)). 1 Apr 1982. (In French). Dep. NTIS (US Sales Only).

From ATSR meeting on health physics; Geneva, Switzerland (12 Nov 1981).

The author discusses the radiation problems which are the radiological influences of LEP which interest the majority of the members of the personnel. The first studies done in this domain are achieved, and the results are published this summer, among others the doses of radiation and of radioactivity and equally the concentration of hoxions gases on the exterior of the enclosure of future installations. The results are the object of discussions and are compared with the norms of radioprotection and with the actual situation in this region.

2383 **(PB—82-192899) 13a assessment of the Texas portions of the Texas Gulf region and the Red River basin. Final report.** (Camp Dresser and McKee, Inc., Austin, TX (USA)). Sep 1981. 144p. NTIS, PC A07/MF A01.

This report summarized present and future water requirements for the study area, anticipated consumptive demands for water by emerging energy technology (EET) development, avail-

ability of water, and impacts of the demands on the region's water resources and other water related factors including the economic, legal, environmental and social implications of use of water for the energy technologies.

2384 **(PNL—4255) Valuing nonmarket goods through contingent markets.** Cronin, F.J. (Pacific Northwest Lab., Richland, WA (USA)). Sep 1982. Contract AC06-76RL01830. 99p. NTIS, PC A05/MF A01. Order Number DE82022544.

This paper estimates the extent and significance of three biases associated with contingent market analysis - strategic bias, information bias, and interviewer bias. The contingent market analyzed is that for improved water quality. The values households place on improved water quality are obtained from a random sample of almost 2000 households in the Washington, DC metropolitan reach of the Potomac River. Thus, the analysis also provides information necessary to select the optimal level of water quality. The findings indicate that the value attached to improved water quality is substantially higher than that estimated in prior studies. Findings support the hypothesis that respondents engaged in strategic behavior. Respondents who were given incentives to bias their revealed value downward were found to have mean bids significant lower than households who were given incentives to bias their revealed values upward. In addition, statistically significant evidence supporting the existence of both information and interviewer bias was found.

2385 **(RFP—3320) Safety reviews: a systematic approach (a training manual for supervisors).** Putzier, E.A. (Rockwell International Corp., Golden, CO (USA). Energy Systems Group). 1981. Contract AC04-76DP03533. 109p. NTIS, PC A06/MF A01. Order Number DE83000076.

Portions of document are illegible.

This risk assessment manual attempts to optimize management decision making for Safety in all aspects of work at Rocky Flats Plant. It addresses thermal, kinetic, chemical, electrical, ionizing, non-ionizing, biological, acoustic, oxygen exclusion, and exposure energy types. (PSB)

2386 **Regional analysis of ground and above-ground climate. Part I. Regional suitability of earth-tempering practices: summary and conclusions. Part II. Bioclimatic data.** Labs, K. (Undercurrent Design Research, New Haven, CT). *Underground Space;* **6**: No. 6, 397-422(May-Jun 1982).

The regional suitability of underground construction as a climate-control technique is discussed with reference to (1) a bioclimatic analysis of long-term weather data for 29 locations in the United States to determine appropriate above-ground climate-control techniques, (2) a data base of synthesized ground temperatures for the coterminous United States, and (3) monthly dewpoint ground temperature comparisons for identifying the relative likelihood of condensation, from one region to another. It is concluded that the suitability of earth tempering as a practice and of specific earth-sheltered design stereotypes varies geographically. While the subsurface almost always provides a thermal advantage on its own terms when compared to above-ground climatic data, it can, nonetheless, compromise the effectiveness of other, regionally more important climate-control techniques. Also contained in the report are reviews of above- and below-ground climate mapping schemes related to human comfort and architectural design, and a detailed description of a theoretical model of ground temperature, heat flow, and heat storage in the ground. Strategies of passive climate control are presented in a discussion of the building bioclimatic analysis procedure which has been applied in a computer analysis of 30 years of weather data for each of 29 locations in the United States. 3 references, 12 figures, 14 tables.

2387 **(DOE/EV/10034—T1-Vol.1-Exec.Summ.) Inventory of federal energy-related environment and safety research for fiscal year 1980. Volume I. Executive summary.** (Environmental Protection Agency, Washington, DC (USA)). 1980. Contract AI01-79EV10034. 72p. NTIS, PC A04/MF A01. Order Number DE83001761.

Portions of document are illegible.

The FY 1980 Federal Inventory contains information on 3603 federally funded energy-related environmental, health, and safety research projects. The Inventory is published in two volumes: Volume I, an executive summary and overview of the data; and Volume II, project listings, summaries, and indexes. Project information for the FY 1980 Inventory was collected from federal agencies using a questionnaire, that is a revision of the FY 1979 questionnaire format, designed to aid the respondent and to provide a more accurate and meaningful expression of project data. Federal offices submitting project data were: Council on Environmental Quality; Department of Agriculture; Department of Commerce; Department of Defense; Department of Energy; Department of Health and Human Services; Department of Housing and Urban Development; Department of the Interior; Environmental Protection Agency; National Aeronautics and Space Administration; National Science Foundation; Nuclear Regulatory Commission; Office of Technology Assessment; and, Tennessee Valley Authority. In addition to providing an overview of federally funded energy-related environmental, health, and safety research, the Inventory also indicates research sponsored by various federal agencies and the amount of funding provided by each in various research categories. The format and indexes employed in the Inventory allow for efficient access to information compiled. Appendix A provides directions for user access to the Federal Inventory Data Base. Appendix B is a sample of the questionnaire used. Appendix C provides a complete list of responding and funding agency abbreviations.

2904 Natural Resources

REFER ALSO TO CITATION(S) 1596, 1748, 2370, 2380

2388 **(AD-A—113144/0) MX siting investigation. mineral resources survey, seven additional valleys, Nevada/Utah siting area. Volume II. Final report.** (Ertec Western, Inc., Long Beach, CA (USA)). 23 Jun 1981. 124p. NTIS, PC A06/MF A01.

Results of the evaluation of the mineral- and energy-resource potential of seven MX valleys in Nevada shows that besides the existing mining activities which occur in many mining districts in this area, a large portion of the area is also interpreted to process high, good, and speculative potential for new economics discoveries to the year 2000 and beyond.

2389 **(AD-A—113145/7) Mineral resources survey, seven additional valleys, Nevada/Utah siting area. Volume III. Final report.** (Ertec Western, Inc., Long Beach, CA (USA)). 23 Jun 1981. 155p. NTIS, PC A08/MF A01.

Results of the evaluation of the mineral- and energy-resource potential of seven MX valleys in Nevada shows that besides the existing mining activities which occur in many mining districts in this area, a large portion of the area is also interpreted to process high, good, and speculative potential for new economics discoveries to the year 2000 and beyond.

2390 **(AD-A—113146/5) MX siting investigation. mineral resources survey, seven additional valleys, Nevada/Utah siting area. Volume IV. Final report.** (Ertec Western, Inc., Long Beach, CA (USA)). 23 Jun 1981. 126p. NTIS, PC A07/MF A01.

Results of the evaluation of the mineral- and energy-resource potential of seven MX valleys in Nevada shows that besides the existing mining activities which occur in many mining districts in this area, a large portion of the area is also interpreted to process high, good, and speculative potential for new economics discoveries to the year 2000 and beyond.

2391 **(PB—82-180027) Minerals yearbook, 1980. Volume I. Metals and minerals.** (Bureau of Mines, Washington, DC (USA)). Jan 1982. 959p. NTIS, PC A99/MF E01.

This yearbook contains chapters on virtually all metallic mineral commodities important to the U.S. economy. In addition, it includes a chapter on mining and quarrying trends.

2392 **(PB—82-198102) Permit requirements for development of energy and other selected natural resources for the state of Idaho.** (Idaho Executive Office of the Governor, Boise (USA)). Aug 1981. 99p. NTIS, PC A05/MF A01.

The purpose of the guidebook is to summarize environmental and land-use permits issued by the State for the development of energy and other natural resources. The guidebook discusses permits that apply to Resource Extraction, Land Use Regulation, Environmental Quality Management, and Social/Ecological Preservation.

2393 **(PB—82-198110) Permit requirements for development of energy and other selected natural resources for the state of Oregon.** (Oregon Office of the Governor, Salem (USA)). Aug 1981. 106p. NTIS, PC A06/MF A01.

The purpose of the guidebook is to summarize environmental and land-use permits issued by the State for the development of energy and other natural resources. The guidebook is intended not only for private developers and interest groups, but also for regulatory officials of Federal, State, and local government as well. The guidebook discusses permits that apply to Resource Extraction, Land Use Regulation, Environmental Quality Management, and Social/Ecological Preservation.

2394 **(USGS-OFR—81-1286) Permit requirements for development of energy and other selected natural resources for the State of Wisconsin.** (Camp Dresser and McKee, Inc., Wheat Ridge, CO (USA)). Aug 1981. 103p. Geological Survey, Open-File Services Section, Denver Federal Center, Box 25425, Denver, CO 80225.

This guidebook is to summarize environmental and land-use permits issued by the State for the development of energy and other natural resources. The guidebook is intended not only for private developers and interest groups, but also for regulatory officials of federal, state, and local government as well. The guidebook is divided into seven sections: Introductory Information; Consolidated Permit Programs; Local Regulatory Policies; Resource Extraction; Land Use Regulation; Environmental Quality Management; and Social/Ecological Preservation. Each section is divided into chapters; each chapter summarizes one permit, license, or approval. Permits administered by a single agency are generally grouped together in each section. (PSB)

2905 Research, Development, Demonstration, And Commercialization

REFER ALSO TO CITATION(S) 1568, 1871, 2380, 2449, 2506

2395 **(EPRI-NP—2562) Technology-transfer workshop.** (Battelle Pacific Northwest Labs., Richland, WA (USA)). Aug 1982. Contract AC06-76RL01830. 256p. (CONF-8109185—). NTIS, PC A12/MF A01. Order Number DE83001224.

From EPRI technology transfer workshop; Seattle, WA, USA (17 Sep 1981).

Portions of document are illegible.

A workshop was held to generate a better understanding of the many diverse factors and steps involved in the technology transfer process. The introductory presentations reviewed relevant theories, addressed the importance of planning for the process, and presented possible organizational structures to help promote the process. Specific cases were used to expose the participants to a variety of situations that were relevant to EPRI. These sessions served as a common starting point for small group discussions that were eventually combined into a list of recommendations for future action by EPRI (and should be useful for others as well). Some of the key conclusions reached are: it is important to identify incentives; the process is more effective if it is personalized; planning cannot start too early; recipes can be developed for customizing to specific situations; and both transmitter and receptor must recognize and fulfill their roles.

2396 **(INIS-mf—7290) CBI report of activities 1980-81.** (Swedish Cement and Concrete Research Inst., Stockholm). 1982. 100p. NTIS (US Sales Only), PC A05/MF A01. Order Number DE83780078.

An overview of the research, consultancy and information activities of the CBI is presented for the period July 1, 1980 to June 30, 1981. (G.T.H.).

2397 **(NP—2904452) Research, development, and demonstration in the field of energy in Switzerland.** (Eidgenoessisches Amt fuer Energiewirtschaft, Bern (Switzerland)). 1981. 37p. (In German). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82904452.

In spring 1979 the Federal Office for Power Economy and the Federal Office for Education and Science made a first joint inquiry on current energy R,D+D projects in Switzerland. Since then it was possible to make a list of such research projects and to estimate to costs of them in 1980 and this year too, thanks to the cooperation of the most different research groups. When stating the costs only the contribution of public authorities and of private foundations for the promotion of research were considered. So as to be able to make a comparison of costs of projects which are carried out by private industry or at universities, the overheads were included too. As a rule the salaries of those working at the research project were put on the same level with overheads.

2398 **(PTB-L—15) Publications of the Physikalisch-Technische Bundesanstalt compiled by Referat Schrifttum.** (Physikalisch-Technische Bundesanstalt, Braunschweig (Germany, F.R.)). Aug 1981. 44p. (In German). Dep. NTIS (US Sales Only), MF A01. Order Number DE82750545.

This Report contains a review of publications published by the PTB, and a list of PTB-reports published to this date, arranged by series.

2399 **Federally funded R and D: new opportunities in Tennessee.** Postma, H. (Oak Ridge National Lab., TN). *Survey of Business;* **18**: No. 1, 10-15(Sum 1982).

The US government provides most of the $800 million a year spent in Tennessee on research and development, with the private sector contributing an estimated $180 million. New governmental policies to encourage spin-offs from the research laboratories located in Kingston, Knoxville, Oak Ridge, and Tullahoma and to attract new high-technology industry recognize the economic benefits of research activities that promote innovation and the transfer of technology to the commercial sector. Recent legislation sets the stage to ease patent grants, stimulate financing for research and commercialization, and to foster an entrepreneurial approach. East Tennessee already has the ingredients necessary for a Technology Corridor in the unique combinations of the University of Tennessee, the Tennessee Valley Authority, and the Oak Ridge National Laboratory. (DCK)

2906 Nuclear Energy

REFER ALSO TO CITATION(S) 1711, 1715, 1820, 1821, 1979, 2096, 2101, 2180, 2213, 2382, 2425

2400 (CERN—82-02, pp 1-16) **Particular problems at high energy accelerators.** Stevenson, G.R. (European Organization for Nuclear Research, Geneva (Switzerland)). 1 Apr 1982. (In French). Dep. NTIS (US Sales Only).

From ATSR meeting on health physics; Geneva, Switzerland (12 Nov 1981).

The special problems of radiation protection at high energy particle accelerators are surveyed: The raised level of induced radioactivity, radiation fields at acceleration, and monitoring of the personnel in radioactive zones of large dimensions.

2401 (CERN—82-02, pp 105-134) **Individual radiation protection at the Saclay accelerators.** Brochen, J.C.; Delsaut, R.; Drouet, J.; Vialettes, H.; Zerbib, J.C. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France)). 1 Apr 1982. (In French). Dep. NTIS (US Sales Only).

From ATSR meeting on health physics; Geneva, Switzerland (12 Nov 1981).

The authors describe the methods for radiation protection at the Saturne synchrotron and the Saclay linear accelerator.

2402 **(INIS-mf—7023) New United States policies regarding international nuclear cooperation.** Marshall, H.R. Jr. (International Nuclear Law Association (INLA), Brussels (Belgium)). Oct 1981. 13p. (CONF-8109120—26). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82780784.

From Nuclear International Jura '81; Palma de Mallorca, Spain (27 Sep 1981).

This paper discusses the United States policy on international nuclear power development in the light of the priorities established by President Reagan in the guidelines for his Administration's nuclear co-operation policy. The aim is to establish a framework allowing for co-operation in peaceful nuclear development while remaining committed to the objective of preventing the further spread of nuclear weapons, in particular by supporting the Non-Proliferation Treaty, the IAEA Safeguards System and the Tlatelolco Treaty.

2403 **(INIS-mf—7024) Nuclear Fuel Supply Arrangements through the IAEA.** Phuong, H.V. (International Atomic Energy Agency, Vienna (Austria)). (International Nuclear Law Association (INLA), Brussels (Belgium)). Oct 1981. 26p. (CONF-8109120—27). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82780785.

From Nuclear International Jura '81; Palma de Mallorca, Spain (27 Sep 1981).

By virtue of its statutory functions, the International Atomic Energy Agency may be the depositary and also the supplier of nuclear materials made available to it by Member States, and these may then be stored in facilities it has acquired or which it has established under its control. However, this possibility did not materialize, mainly because the supplying states -few in number- do not want an international organization to become directly involved in bilateral transactions in that field. This paper analyses in particular the provisions of supply agreements concluded with the United Kingdom, the USA and the USSR. The Annex contains a Table of Agreements on supply of nuclear fuel and equipment concluded between supplying and consumer states through the IAEA.

2404 **(INIS-mf—7159) British Nuclear Fuels Limited (Transfer of Shares) Order 1981 (S.I. No. 868 of 18 June 1981).** 3 Aug 1981. 2p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83780026.

This Order transfers to the Secretary of State for Energy all the shares in British Nuclear Fuels Limited previously held by the United Kingdom Atomic Energy Authority. (NEA).

2405 **(INIS-mf—7160) Atomic Energy (Miscellaneous Provisions) Act 1981.** 27 Jul 1981. 3p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83780027.

This Act extends the power of the United Kingdom Atomic Energy Authority to dispose of shares held by it in any company, and the power of the Secretary of State for Energy to dispose of shares held by him in companies engaged in activities in the field of atomic energy or radioactive substances.

2406 **(INIS-mf—7161) Amersham International Limited (Transfer of Shares) Order 1981 (S.I. No. 850 of 9 June 1981).** 1 Oct 1981. 2p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83780028.

This Order transfers to the Secretary of State for Energy all the shares in Amersham International Limited previously held by the United Kingdom Atomic Energy Authority..

2407 **(INIS-mf—7265) Opening address.** Donnelly, J. (Atomic Energy of Canada Ltd., Ottawa, Ontario). Jun 1981. 6p. (CONF-8106200—14). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83780066.

From 21. annual international conference on Canadian Nuclear Association and 2. annual conference on Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

The supply of energy is the most important problem facing mankind today. Energy is necessary for economic development, and it is in the interests of the industrialized nations to ensure that the developing countries reach their economic potential. The need for the increased use of nuclear power is evident, and the CANDU reactor provides a simple, proven energy source; the 950 MW CANDU has potential applications in both industrialized and third world nations. The Canadian nuclear industry has an important role to play in the world, but must be rationalized in order to compete successfully in the international marketplace.

2408 **(INIS-mf—7266) International marketing of CANDU.** Douglas, J.M. (Organization of CANDU Industries); Jackson, H.A. (Ontario Hydro, Toronto (Canada)); Chiperzak, A. (Department of Industry, Trade and Commerce, Ottawa, Ontario (Canada)); Creighton, W.L. (Atomic Energy of Canada Ltd., Ottawa, Ontario). Jun 1981. 28p. (CONF-8106200—15). NTIS (US Sales Only), PC A03/MF A01. Order Number DE83780067.

From 21. annual international conference on Canadian Nuclear Association and 2. annual conference on Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

During the 1960's and 70's the nuclear industry all over the world increased its capacity to meet anticipated orders resulting from expected economic growth. When these orders did not materialize, the industry was left with excess capacity, and competition grew fierce. The outlook is good, however, since it has become imperative for the world to move away from oil to nuclear power. In advanced but oil-deficient nations such as Japan the shift to nuclear has already begun, and the same is happening in rapidly industrializing countries such as Korea, Yugoslavia and Romania. Major oil-exporting countries such as Mexico are looking at nuclear power as a method of preserving their petroleum for export. There are opportunities for Canada in all these markets, and they are being pursued aggressively. Ways in which Canada can assist in the development of a nuclear industry in a country such as Indonesia, and meet the needs of a country with a fully-developed nuclear industry such as Japan, are discussed.

2409 **(INIS-mf—7270) Role of nuclear power in the U.S.A.** Walske, C. (Atomic Industrial Forum, Inc., Washington, DC (USA)). Jun 1981. 7p. (CONF-8106200—16). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83780068.

From 21. annual international conference on Canadian Nuclear Association and 2. annual conference on Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

Presently the United States has a total electrical generating capacity of about 600 gigawatts, of which 56 GW is nuclear-fuelled. Actual generation is about 12 percent nuclear. Another 90 GW nuclear and 130 GW coal-fired capacity are under construction. No new orders for nuclear power plants have been received since 1978, and recently cancellations for nuclear plants have been exceeding gross coal ordering rates. If U.S. utilities are to continue to expand at their current rate, at least 40 GW of new capacity should be ordered every year. By the year 2000 another 20-70 percent more energy will be needed to meet the demand from a mature population with an increased proportion in the work force. Double-digit inflation, increased regulatory requirements, and higher fuel costs have made it difficult for electric utilites to obtain financing for new plants; time delays in obtaining regulatory agency approvals have added interest expenses to the cost of plants already under construction. The political climate is improving for nuclear power, and public opinion remains generally favourable.

2410 **(INIS-mf—7271) Nuclear energy's continuing benefits to Canada.** Gray, J.L. (Canadian Nuclear Association, Toronto, Ontario). Jun 1981. 23p. (CONF-8106200—17). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83780069.

From 21. annual international conference on Canadian Nuclear Association and 2. annual conference on Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

The goal of the Canadian nuclear power program when it began twenty years ago was to reduce Canadian dependence on imported coal. This goal has been met, with 35 percent of Ontario's electricity being produced by CANDU reactors. These reactors have been proven reliable and safe, and provide a considerable cost advantage over coal. The CANDU reactor was developed with the strengths and limitations of Canadian industry in mind, the newest stations have over 85 percent Canadian-manufactured components.

A similar benefit should be found in many countries with manufacturing capabilities comparable to Canada's. The use of natural uranium as a fuel has been a wise choice both technically and economically. A new industry was created in Canada in order to gain an assured supply of heavy water. The personnel brought to or trained in Canada to work in all parts of the nuclear industry represent a valuable asset in themselves. Radioisotope exports are making a significant contribution. Nuclear power is likely to make its greatest impact in the next century, when it will be a necessity.

2411 **(INIS-mf—7284) Notes for an address.** Lalonde, M. (Department of Energy, Mines and Resources, Ottawa, Ontario (Canada)). Jun 1981. 8p. (CONF-8106200—21). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83780073.

From 21. annual international conference on Canadian Nuclear Association and 2. annual conference on Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

The government of Canada is involved in the nuclear industry both as a regulator, through the Atomic Energy Control Board, and as a promoter, through Atomic Energy of Canda Ltd. and Eldorado Nuclear. These roles reflect government's desire to ensure that the benefits continue to outweigh the risks of nuclear power. The government is in the process of considering the options available in its policy towards the nuclear industry. Nuclear exports are advantageous to the country, both directly and as a step towards other high-technology exports. A strong safeguards policy is a prerequisite for exports. Nuclear-generated electricity will be one of the substitutes for oil as the country attempts to reduce oil consumption to 10 percent of primary energy use by 1990. Uranium production is one of Canada's strengths. Short-term storage of radioactive wastes is being handled well, and the research program into long-term disposal is making progress. The nuclear industry's attitude towards its waste should serve as a model for other industries. There is much less technological uncertainty about the ability of the CANDU system to meet future energy needs than there is about most other energy sources.

2412 **(INIS-mf—7285) Notes for an address.** MacEachen, A.J. (Department of Finance, Ottawa, Ontario (Canada)). Jun 1981. 23p. (CONF-8106200—22). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83780074.

From 21. annual international conference on Canadian Nuclear Association and 2. annual conference on Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

Over the years, the Canadian government has invested heavily in the nuclear industry. More than $2 billion has been spent on research and development, which now costs upward of $140 million annually. The federal government shared the costs of the first two Pickering reactors and of the heavy water plants. Government loans and international assistance programs have helped the financing of reactor sales to India, Pakistan, Korea, Argentina and Romania. In the late 1940s the federal government purchased Eldorado Nuclear Ltd., and since then has spent over $100 million to help uranium producers. The costs of all these programs have been borne by all Canadian taxpayers, while the considerable benefits have accrued mainly to the provinces with nuclear power programs or significant elements of the nuclear industry: Ontario, and to a lesser extent Quebec, Nova Scotia, and soon New Brunswick. Recent events have dimmed prospects for the nuclear industry, and it appears that more help may be needed. Although the Canadian nuclear industry will not be allowed to die, the financial burdens are going to have to be shared more fairly by those who benefit.

2413 **(INIS-mf—7300) Planning the extension of nuclear parks for an integrated system of thermal power plants with the aid of dynamic programming - alogrithm for discrete decision processes with ranked decision variables.** Winske, P. (Technische Hochschule Aachen (Germany, F.R.). Fakultaet fuer Maschinenwesen). 19 Mar 1979. 198p. (In German). NTIS (US Sales Only), PC A09/MF A01. Order Number DE83780075.

Thesis.

The work discusses the question how in competition with conventional fossil- and nuclear-heated single block installations the blocks of a nuclear park are to be added to an existing thermal power plants system with the power generation costs being minimized. The introduction is followed by a description of the initial problem, and some essential views of the classical planning of the development and utilization of a thermal power plants system are explained. The basis of the dynamic programming are then presented. Most of the room is taken up by the description of the technique applied for solving the initial problem. Furthermore, a methodic comparison between the developed mathematical model and the best-known power plant construction models is affected. Another chapter demonstrates by means of abstraction of the special example of the mathematical model that the developed algorithm of the dynamic programming can also be applied to a general discrete decision process. After this the suitability of the new developed algorithm of the dynamic programming for solving the initial problem additional building of nuclear parks is proved. (UA).

2907 Transport And Storage

REFER ALSO TO CITATION(S) 2353

2908 Waste Heat Utilization

REFER ALSO TO CITATION(S) 2506, 2518

2414 **(PB—82-200692) Cogeneration energy systems assessment. Volume I: technical discussion. Final report Apr 81-Jan 82.** Cummings, C.; Erickson, R.; Casten, T.; Martorella, J.; Karamchetty, S. (Science Applications, Inc., La Jolla, CA (USA)). Mar 1982. 252p. NTIS, PC A12/MF A01.

The assessment of gas-fueled cogeneration was initiated to identify research and development opportunities and priorities that would maximize the benefits of cogeneration to the gas consumer and utilities. The work focused primarily on the commercial and multi-family residential market sectors ranging in size from 100 kilowatts (kW) to 10 megawatts (MW). Cogeneration that produced mechnical (shaft horsepower) energy as the primary power was excluded. Significant technical, economic, and market potential for cogeneration systems in the commercial sector was found to exist. In addition, research and development (R and D) efforts can have a beneficial impact on the market potential for cogeneration, particularly in the smaller size ranges (<1MW).

2910 Conservation

REFER ALSO TO CITATION(S) 1648, 2380, 2434, 2458, 2459, 2464, 2471, 2472, 2474, 2483, 2518, 2528

2415 **(PB—82-192600) State-local policy management project. Final report.** (National Governors' Association, Washington, DC (USA)). Aug 1981. 86p. NTIS, PC A05/MF A01.

The report describes case studies to explore new approaches for increasing state and local coordination in planning and managing programs in areas with significant scientific and technical components such as energy and environment. Specifically, the case studies reveal efforts of various states in the areas of energy conservation, weatherization, emergency preparedness, and air quality. Successes and failures of Maryland's decentralized approach to energy conservation are documented; success of the thermal and lighting efficiency standards program in Texas is discussed; state aid for local energy conservation programs in Clinton County, Michigan, is reviewed; and the success of the weatherization program in Oregon is examined. Pilot programs in weatherization in Pennsylvania are shown to have led a statewide effort. Two Minnesota projects in emergency preparedness are documented and factors for success are listed. In addition, long-range planning for fuel shortages in New York is examined and the benefits of regional planning in Fairfax County, Virgina, are noted. Efforts are examined to improve air quality in Ohio, California, and New Jersey.

2920 Supply, Demand, And Forecasting

REFER ALSO TO CITATION(S) 1645, 1646, 2515

2416 **(CONF-811267—Summ.) International energy workshop, 1981. Summary report.** Manne, A.S. (ed.). (Stanford Univ., CA (USA). Inst. for Energy Studies). Jun 1982. Contract AT03-79PE70117. 47p. NTIS, PC A03/MF A01. Order Number DE82021183.

From International energy workshop; Stanford, CA, USA (10 Dec 1981).

Portions of document are illegible.

Individual papers are synopsized with an overall assessment of the workshop. Poll results taken during the workshop are presented with tabulated data on: real price of crude oil; real GNP; total primary energy consumption; domestic oil production, and oil imports for 1990 and 2000. A reference case is projected. (PSB)

2417 **(PB—82-191008) Preliminary energy demand studies for Ireland. base case and high case for 1980, 1985 and 1990. Final report.** Henry, E.W. (Commission of the European Communities, Luxembourg). 1981. 100p. NTIS PC E05/MF E05.

Forecasts for base case and high case energy models for 1980, 1985 and 1990 have been made. Estimates of the values of the macro-economic variables were given to DULBEA for EURECA (European energy consumption analysis). The output from EURECA gave the macro-aggregates as well as data on aggregated price indices for imports. The macro-economic information was introduced into the EXPLOR input/output model by scaling vectors. EPLOR results included sectoral activities, prices, productivity and wages, labor demand and final energy demand. Data limitations are discussed and comparisons of base case and high case made.

2418 **(PB—82-200205) UK case studies using the integrated EC energy modelling system. Final report.** Hughes, C.; Parry, N. (Commission of the European Communities, Luxembourg). [nd]. 66p. NTIS PC E04/MF E04.

Three case studies showing different energy scenarios are discussed. A base case predicts plausible estimates for sectoral output and price indices, for output and domestic consumption of several energy intensive products, and for energy demand (for each of nine fuels as well as in total) for 1980, 1985, and 1990. A second case gives results for the same variables under conditions of increased oil prices to a level 75% higher than for the base case in 1990. In a third case, base results are adjusted in accordance with gas prices being set at the thermal equivalent of oil prices by 1990. An Appendix explains the major economic assumptions.

2419 **(PB—82-205410) Taking stock and further outlook with an appendix on nontechnical aspects.** Harter, M.; Lindner, R. (Commission of the European Communities, Luxembourg). [nd]. 242p. (In German). (EUR—7075-DE). NTIS PC E09/MF E09.

The energy situation is considered on three fronts: (a) the world situation; (b) the position in the European Economic Community, and (c) the situation in the Federal Republic of Germany. For (a), demand and supply (petroleum, natural gas, coal, regenerative energy sources, and power generation capacities) are considered. In (b), an analysis of demand and forecasts are made in relation to commerce, industry, the private household and the small consumer. Petroleum, natural gas, coal, natural energy sources, and alternative fuel technologies are discussed. With (c), the demands of the private household (non-electric and electric), of the small consumer, commerce and industry are considered and compared with the supply position, taking into account investment and time lag (i.e. length of lead-time), and price growth. The forecasting and evaluation problem is assessed. Some non-technical matters, such as economics, politics and environmental questions are considered and related to the energy problem.

2930 Policy, Legislation, And Regulation

REFER ALSO TO CITATION(S) 1820, 2372, 2394, 2400, 2401, 2426, 2436, 2994, 3034, 3060

2420 **(ANL/EES-TM—192) Commerce clause limitations on state regulation and taxation of the energy industry.** Tanzman, E.A. (Argonne National Lab., IL (USA)). Jul 1982. Contract W-31-109-ENG-38. 40p. NTIS, PC A03/MF A01. Order Number DE83000939.

As the federal government reduces its control over the energy industry, states that wish to increase their energy regulations and taxes will find a more favorable constitutional climate than in the recent past. Commerce clause restrictions that once automatically invalidated state laws that regulated or taxed energy in interstate commerce have been loosened. The once moribund doctrine of concurrent federal and state authority over interstate commerce announced in Cooley vs. Board of Wardens has been resurrected in a modern form. With these changes has come a reaffirmation of the basic purpose of the commerce clause to prohibit discrimination by a state in favor of its citizens or against those of other states. The outcomes of New England Power Co. vs. New Hampshire and Maryland vs. Louisiana emphasize that the Court will not tolerate direct geographical favoritism in either regulatory or tax laws, even under today's easier commerce clause restrictions. The Court has rarely lost sight of the basic uniting force of the commerce clause.

2421 **(INIS-mf—7272) Perspective on the substitution of electricity for oil.** De Guise, Y. (Lavalin Inc., Montreal, Quebec (Canada)). Jun 1981. 31p. (CONF-8106200—18). NTIS (US Sales Only), PC A03/MF A01. Order Number DE83780070.

From 21. annual international conference on Canadian Nuclear Association and 2. annual conference on Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

The prospects for substitution of electricity for oil are discussed. Current oil use in Canada and abroad is reviewed along with studies giving projections of future use. The author shows that electricity is in a position to adequately substitute for oil in most situations. While electricity comprised 34 percent of Canadian primary energy supply in 1979, it is expected to increase to 50 percent in 2000.

2422 **(PB—82-188236) Hazardous substance liability insurance.** (Department of the Treasury, Washington, DC (USA)). Mar 1982. 273p. NTIS, PC A12/MF A01.

The study was carried out to meet requirements of the Comprehensive Environmental Response, Compensation and Liability Act of 1980. It considers the adequacy and feasibility of private insurance to protect owners and operators of ships covered by the Act and for post-closure financial responsibility for hazardous waste disposal facilities. The report is in three parts: Pt. 1 is an introduction to the hazardous substance insurance problem; Pt. 2 considers the adequacy of private insurance for owners and operators of vessels and facilities; Pt. 3 focuses on the problem of a private insurance alternative to the Post-Closure Liability Fund for 'inactive' hazardous waste disposal facilities.

2940 Fossil Fuels

REFER ALSO TO CITATION(S) 1568, 1568, 1583, 1596, 1598, 1645, 1646, 1647, 1647, 1649, 1660, 1660, 2180, 2380, 2416, 2432, 2958

2423 **(NP—2904453) Long-term effects of crude oil shock.** Jolles, P.R. (Argauische Industrie- und Handelskammer, Baden (Switzerland)). 1981. 31p. (In German). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82904453.

Lecture held on the occasion of the general assembly of the Aargauische Industrie- und Handelskammer on May 19, 1981 in Baden, Switzerland.

The long-term tendency of crude oil to become scarcer and the enormous price increase to be expected cause fundamental

changes of international economic conditions. Each state and business sees itself forced to take almost existential decisions. The alternatives are protectianist measures on the one hand and efforts by industrialists, which result in technical innovation and structural changes, on the other hand.

2950 Hydrogen And Synthetic Fuels

REFER ALSO TO CITATION(S) 1846, 2481

2960 Electric Power

REFER ALSO TO CITATION(S) 2074, 2213, 2379, 2432, 2436, 2524, 2958, 3896

2424 **(DOE/EIA—0343) Capacity utilization and fuel consumption in the electric power industry, 1970-1981.** Lewis, E.W. (USDOE Energy Information Administration, Washington, DC. Office of Coal, Nuclear, Electric and Alternate Fuels). Jul 1982. 187p. NTIS, PC A09/MF A01. Order Number DE83000883.

This report updates the 1980 Energy Information Administration (EIA) publication entitled Trends in the Capacity Utilization and Fuel Consumption of Electric Utility Powerplants, 1970-1978, DOE/EIA-184/32. The analysis covers the period from 1970 through 1981, and examines trends during the period prior to the 1973 Arab oil embargo (1970-1973), after the embargo (1974-1977), and during the immediate past (1978-1981). The report also addresses other factors affecting the electric utility industry since the oil embargo: the reduction in foreign oil supplies as a result of the 1979 Iranian crisis, the 1977 drought in the western United States, the 1978 coal strike by the United Mine Workers Union, and the shutdown of nuclear plants in response to the accident at Three Mile Island. Annual data on electric utility generating capacity, net generation, and fuel consumption are provided to identify changes in patterns of power plant capacity utilization and dispatching.

2425 **(INIS-mf—7282) Development of the Mexican electric power sector.** Escofet, A. (Comision Federal de Electricidad, Mexico City). Jun 1981. 24p. (CONF-8106200—19). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83780071.

From 21. annual international conference on Canadian Nuclear Association and 2. annual conference on Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

In 1980 Mexico had a population of 68 million, mostly concentrated in a few cities with many other areas being practically unpopulated. The country is semi-industrialized, and in order to achieve better standards of living, economic growth will have to continue at about 7.5 percent or more, particularly if the population continues to increase at 2.9 percent per year. The total installed electrical capacity at the end of 1980 was 14 600 MW; the per capita consumption of electricity was 910 KWh. The present government has as a goal an 8 percent annual growth rate in gross domestic product until 1995, resulting in forecast of a 12.5 percent growth rate in the electric sector to about 410 TWh per year. Hydroelectric power could be used to produce 80 TWh a year by 2000 if capacity were quadrupled. The use of coal for the production of electricity is beginning, and it is planned to generate 40 TWh a year from this source by 2000. Geothermal power should yield 20 TWh by then. A goal has been set of 20 000 MW of installed nuclear capacity by the end of the century; this would produce about 130 TWh, leaving some 280 TWh to be generated by oil or gas. The planned nuclear program must include the development of a strong Mexican nuclear industry, so that in 20 years 80 percent of the nuclear plant components could be locally produced. Ultimately it is hoped that Mexico will have the capability of installing, with its own resources, five or six large nuclear plants per year.

2426 **(INIS-mf—7283) Notes for an address.** Welch, R.W. (Ontario Ministry of Energy, Toronto (Canada)). Jun 1981. 6p. (CONF-8106200—20). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83780072.

From 21. annual international conference on Canadian Nuclear Association and 2. annual conference on Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

The policy of the Ontario government is to ensure that consumers have access to a full range of competitively-priced energy forms. Nuclear power is more desirable than coal, both environmentally and from the point of view of cost, and the nuclear industry is also important to Ontario, providing jobs and contributing to the province's industrial development. The government of Ontario is exploring the possibility of exporting surplus electrical power when a profit can be made. Ontario Hydro has been exporting electricity for about 60 years, and sales to the United States have increased significantly since 1973, allowing rates to Ontario consumers to be lowered. Exports at present are from fossil-fired plants, increasing nuclear capacity frees the more expensive coal-fuelled capacity for export purposes. In past generating plants have not been built exclusively for the export market, and only short-term power surplusses have been exported. Over the next ten years exports are likely to remain about 10 billion kilowatt-hours per year. It would be environmentally advantageous for Ontario to build nuclear plants to generate electricity for the American market, rather than have to import acid rain from US coal-fired power plants. Much depends on public opinion and government policies at the federal level in both countries.

2427 **(NP—2904457) Economic effects of inexact input information in the short-term management planning of thermal power plants.** Machate, R.D. (Technische Hochschule Aachen (Germany, F.R.). Fakultaet fuer Elektrotechnik). 18 Dec 1979. 132p. (In German). NTIS (US Sales Only), PC A07/MF A01. Order Number DE82904457.

Thesis.

Economic daily operation planning of thermal power plants has the task of distributing the time-dependent load to the power plant units in such a way that the operating costs are kept as low as possible if all technical and economic framework conditions are maintained. That is why this study investigates how the management planning is influenced by inaccuracies and what kind of profit can be attained in spite of inaccurate input information with a mathematically - oriented as opposed to a simple method of operation. In order to exemplify these problems a simple method of operation which imitates the heuristic - also manually feasible - management planning and a mathematically-oriented method of operation using the dynamic optimization were developed. Both methods were compared with each other and with two other mathematically-oriented methods. It can be demonstrated that the method based on dynamics optimization, inspite of considerably less computing expenditure, had provided the same good solutions as the most complicated method basing on mixed-integral linear optimization.

2428 **(PB—82-180183) Deregulating the electric utility industry. Final report.** Bohn, R.E.; Tabors, R.D.; Golub, B.W.; Schweppe, F.C. (Massachusetts Inst. of Tech., Cambridge (USA). Energy Lab.). Jan 1982. 70p. (MIT-EL—82-003). NTIS, PC A04/MF A01.

Many functions must be performed in any large electric power system. A specific proposal for a deregulated power system, based on a real-time spot energy marketplace, is presented and analyzed. A central TandD utility acts as a market maker, setting prices to equilibrate supply and demand. Decentralized competitive firms invest and operate in response to current and projected spot prices. The paper explicitly addresses the many practical engineering and economic functions and issues which must be taken into account by any proposal to deregulate electric power generation. It does not answer the question of whether deregulation is a good idea.

2429 **Averch-Johnson model with Leontief production functions: extensions and applications.** Murphy, F.H. (Dept. of Energy, Washington, DC); Soyster, A.L. *Energy Economics;* 4: No. 3, 169-179(Jul 1982).

The Averch-Johnson (A-J) thesis suggests that regulated utilities may tend to select production processes which are highly capital-intensive. The main thrust of this paper is a discussion of the results from developing and implementing the A-J theory within

the context of an electric-utility model used by the Energy Information Administration of the Department of Energy. The objective is to contrast the different forecasts obtained by explicitly incorporating the alternative behavioral theories of cost minimization and profit maximization directly into the model. Hence, rather than testing for the presence of the so-called A-J effect, this paper examines the consequences of assuming the two theories on electric-utility behavior within the context of a single model. 25 references, 4 figures, 7 tables.

2980 Consumption And Utilization

REFER ALSO TO CITATION(S) 2384, 2475

2430 **(LA—9526-MS) Energy supply and demand in the Caribbean Region, 1978-2000.** Ruhm, C.J. (Los Alamos National Lab., NM (USA)). Sep 1982. Contract W-7405-ENG-36. 65p. NTIS, PC A04/MF A01. Order Number DE83002312.

This study discusses and projects energy demand for countries in and bordering the Caribbean Ocean through the year 2000. Forecasts, on a country-by-country basis, are formed using estimates for the gross domestic product growth rates, petroleum price increases, and income and price elasticities. Energy demand is generally concluded to rise during the forecast period, even with greater conservation efforts, but at a slower rate than in the past. The costs of imported energy are projected to increase faster than national incomes and in some cases may seriously adversely affect prospects for economic development. Energy demands are further projected on a sector-by-sector basis for Central American nations. These forecasts are consistent with results of the aggregated projections and indicate that for these countries, major efforts should be devoted towards reducing the transportation sector's demand for energy.

2431 **(NZERDC-P—59) Fuel use in New Zealand agriculture: an aggregate time-series analysis.** Chudleigh, P.D. (New Zealand Energy Research and Development Committee, Auckland). Apr 1982. 26p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE83900035.

An underlying hypothesis of the study reported is that fuel use in the sheep and beef sector of New Zealand agriculture is highly inelastic with respect to the price of fuel. An objective of the study was to test the hypothesis using time series data from sheep and beef farms over the 1960 to 1977 period. Another objective was to define a relationship between sheep and beef farm output and fuel use. The study concentrates on liquid fuel inputs used by farms and neglects other oil-based inputs. It refers to the sheep and beef sectors largely in an aggregate manner. (LEW)

2432 **(UCID—19227-81) US energy flow, 1981.** Briggs, C.K.; Borg, I.Y. (Lawrence Livermore National Lab., CA (USA)). 1 Oct 1982. Contract W-7405-ENG-48. 19p. NTIS, PC A02/MF A01. Order Number DE83001579.

Flow diagrams to describe the US energy situation have been prepared since 1972 by the Lawrence Livermore National Laboratory. In 1981 the energy consumption was 73 quads (or 73 x 10^{15} Btu) - down from 75 quads in 1980. Oil continues to dominate the picture as it comprises 45% of the total energy used. Net oil use (exclusive of oil purchased for the Strategic Petroleum Reserve and exports) fell 8%; oil imports declined 14%. In contrast to oil, use of natural gas and coal remained at 1980 levels. Decreased use of residual oils, principally for electric power generation, account for much of the drop in oil use. Increased use of coal and nuclear energy for power generation almost compensated for the decrease in use of oil in that end-use. Transmitted power remained at 1980 levels. The remainder of the drop in energy usage is attributed to price-driven conservation, increased efficiencies in end-use and the recession that prevailed during most of the year. The share of the energy drop attributable to the recession is estimated by various analysts to be on the order of 40 to 50%. The fact that for a given dollar of US GNP, oil consumption has declined faster than overall energy consumption attests to the role factors other than the economic slow-down have had on decreased energy consumption. Gasoline consumption remained at 1980 levels and the total transportation end-use sector increased its energy consumption by a modest 3%.

2433 **Domestic energy: a forgotten factor in simple energy-economy models.** Peck, S.C. (Electric Power Research Inst., Palo Alto, CA); Solow, J.L. *Energy Journal;* 3: No. 3, 39-52(Jul 1982).

This paper focuses on the impacts of world energy prices on an energy-importing economy such as the US. It examines in detail Sweeney's model of energy-economy interaction, which takes explicit account of the fact that the US energy sector is linked to the rest of the world and that the US is a net importer of energy. Results show that energy-consumption taxes and production subsidies do not influence the extent of energy-economy interaction. This result is exactly true when the domestic energy demand-and-supply functions are linear, and is approximately true for loglinear functions in the common ranges of parameter and price variation. The authors see only a limited impact of higher world energy prices where a large domestic energy sector exists. The elasticity of domestic energy supply and the elasticity of demand are of equal importance. 6 figures.

2434 **Audit of energy consumption in the city of Riverside, California: methodology and results.** Talbert, S.B.; Jakob, F.E. (Battelle, Columbus Lab, OH). *Energy Engineering;* 78: No. 3, 23-40(1981).

This audit provided valuable information regarding the distribution of, and demands for, thermal and electrical energy throughout the city. Energy-consumption patterns were determined for each of the 31 census tracts and 15 subcommunities within the city, and divided up among residential, commercial, and industrial users in terms of peak, average, and base energy loads. Projections were also made for energy needs until the year 2000.

2990 Unconventional Sources And Power Generation

REFER ALSO TO CITATION(S) 1648, 1884, 1886, 1887, 1891, 1893, 1914, 1915, 1916, 1917, 1918, 1931, 2004, 2041, 2042, 2054, 2379, 2425, 2519, 2528

2435 **(NP—2904714) Economic and technical feasibility of solar energy in industry and transportation.** Hake, B.; Stoecker, H.J. (Societaet fuer Unternehmungsplanung (S.U.P.), Wiesbaden (Germany, F.R.)). 2 Mar 1981. 91p. NTIS (US Sales Only), PC A05/MF A01. Order Number DE82904714.

The report investigates the criteria employed by potential industrial customers (excluding food industry) for solar energy equipment to determine its acceptance for investments. The industrial demand for energy by temperature levels, by industry branch and by country is investigated. Current technologies for industrial process heat from solar energy are reviewed. The economics of flat-plate collectors, vacuum-tube collectors, concentrating trough collectors, photovoltaic conversion and diesel-engine driven heat pumps are determined in terms of DM/kWh and 'capital flowback' for the investment on the basis of present prices for light heating oil of DM 0.60 and DM 1.-/l. The report concludes that only diesel and gas engine heat pumps have an economic performance that makes them acceptable to industrial users for low-temperature process heat and heating of offices and factories.

2436 (NRAES—13, pp 158-163) **Parallel generation of electricity with the electric utility.** Schiefen, L.M. Jr. 1981. Northeast Regional Agricultural Engineering Service, Ithaca, NY 14853.

From Methane technology for agriculture conference; Ithaca, NY, USA (17 Mar 1981).

The Public Utility Regulatory Policies Act (PURPA) defines small power producers as facilities generating not more than 80 megawatts and using renewable resources as fuel, and defines cogeneration as the combined production of electric power and useful heat by sequential use of energy from one fuel source. Sections 201 and 210 of PURPA remove regulatory obstacles and require electric utilities to offer to purchase electric energy from qualifying cogenerators and small power producers at just and reasonable rates.

State utility commissions are at present deliberating over these rates and are considering the requirements for interconnection.

30 DIRECT ENERGY CONVERSION

3001 Mhd Generators

2437 **(AD-A—112049/2) Explosion driven magnetogasdynamic flows with high magnetic Reynolds and interaction numbers. Annual report, 1 February-30 September 1981.** Wilhelm, H.E. (Naval Weapons Center, China Lake, CA (USA)). 1 Dec 1981. 120p. NTIS, PC A06/MF A01.

Detonation driven magnetogasdynamic generators with external R-L load circuits are analyzed, for which the external and induced magnetic fields are parallel and antiparallel, respectively. Two plasma shock flow models are treated: (i) implosion produced jet flow and (ii) plane detonation flow. A theory of power generation is developed for a stress polarizable solid between plane electrodes (with an external ohmic load circuit), which is electrically polarized by an explosion produced stress shock wave. In connection with the analysis of flux compression power generators, initial-boundary-value problems for the diffusion of magnetic fields into conductors with external electromagnetic transients and the electromagnetic induction in conductors accelerated in external magnetic fields are solved. A quantum-kinetic theory of the anomalous electron heating in plasmas by high-frequency electromagnetic fields is presented.

2438 **(AD-A—112102/9) High power MHD system - facility status and magnet test results. Final report 1 Jul 77-30 Sep 80.** Whitehead, G.L. (Arnold Engineering Development Center, Arnold Air Force Station, TN (USA)). Feb 1982. 107p. (AEDC-TR—81-14). NTIS, PC A06/MF A01.

AEDC has been requested by the Aero Propulsion Laboratory to design, fabricate, and install facility hardware necessary to conduct tests to demonstrate the performance of high power MHD generator systems developed by AFWAL contractors. This report summarizes the AEDC effort since program inception, describes the facility under development, gives the status of each major facility component, and summarizes the results of the data acquired during magnet checkout tests. The report also describes the future effort required to make the facility a useful tool for MHD generator system and component development.

2439 **(ANL/MHD—82-7) Swirl combustor performance and analysis.** Reed, C.B.; Dunn, P.F. (Argonne National Lab., IL (USA)). Sep 1982. Contract W-31-109-ENG-38. 88p. NTIS, PC A05/MF A01. Order Number DE83000919.

Portions of document are illegible.

At Argonne National Laboratory (ANL) a series of tests was conducted to characterize the performance of a two-stage swirl combustor developed for MHD applications. The combustor was designed and fabricated by TRW Inc. and leased from them by ANL. The combustor was designed for a nominal 10 MW/sub t/ operating power level at 5 atm but was operated near 1 atm in these tests at 3 MW/sub t/ nominally. Six tests were conducted at stoichiometries ranging from 0.85 to 1.67. The nominal operating pressure was 1.3 atmospheres and the oxidant, air, was electrically preheated to temperatures ranging from 760 K to 980 K. Measurements were made of combustor heat loss, apparent combustion gas temperature, and combustion gas composition. An existing one-dimensional flow model with radiative heat loss was employed to describe the solid fuel ignition, the subsequent vaporization of ash, and the devolatilization, combustion, and gasification of the coal. The model assumed that the combustion products were redistributed in the main gas stream of the combustor according to simplified chemical equilibrium criteria. The heat loss, gas temperature, and chemical composition predictions of the model were compared to the data collected from the combustor during the six tests. Some areas of improvement in the model were identified for future work.

2440 **(DOE/ET/10815—76) Coal injectors performance study.** Gonzalez, D.E.; Catalano, C.G. (Tennessee Univ., Tullahoma (USA). Space Inst.). Feb 1982. Contract AC02-79ET10815. 60p. NTIS, PC A04/MF A01. Order Number DE83000034.

This report describes experimental studies designed to provide information on the performance of pulverized coal injectors for MHD combustors. All tests were conducted under free jet conditions. Pure coal and mixtures of coal and potassium carbonate (K_2CO_3) were injected through six different injectors. A transparent test section was used to permit observation and photography. Isokinetic sampling with a moveable probe system and visual observation was used to characterize the pulverized coal jet flow fields. Mass flux distributions for each jet were determined and a dispersion parameter was defined to measure injector performance.

2441 **(DOE/MC/16242—4) Hot-gas cleanup for molten carbonate fuel cells: dechlorination and soot formation. Annual topical report, May 19, 1981-July 18, 1982.** Gelb, A.; Ham, D.; Lewis, P.; Lord, G.; Simons, G. (Physical Sciences, Inc., Woburn, MA (USA)). 1982. Contract AC21-81MC16242. 67p. (PSI-TR—315). NTIS, PC A04/MF A01. Order Number DE83001870.

Portions of document are illegible.

Two separate aspects of hot-gas conditioning for molten carbonate fuel cells (MCFC) were investigated under this contract: a thermodynamic analysis and screening of potential high temperature chloride sorbent materials and an experimental study of carbon deposition conditions on MCFC components to determine guidelines for maximizing MCFC efficiency while avoiding carbon fouling. Initial evaluation and screening of candidate sorbent materials for high temperature removal of HCl from coal gasifier effluent has been completed. Lower limits on the pressure of chloride species over potential sorbents were determined from equilibrium thermodynamics of the gas mixtures and sorbent materials. Sodium and potassium carbonates have been identified as the best candidates for chloride cleanup. Sulfide species should not interfere with this chloride sorption. Measurements showed that carbon deposition boundaries are determined by chemical kinetics such that carbon fouling can occur in the equilibrium carbon free region because of the relative rates of the relevant reactions; on all surfaces tested the Boudouard carbon formation reaction is much faster than the water-gas shift reaction which is much faster than the methanation reaction. This means that the normal practice of adding H_2O to prevent carbon formation will only succeed if flows are slow enough for the water shift reaction to go substantially to completion. More direct suppression of carbon formation can be achieved by CO_2 addition through anode recycle to force the Boudouard reaction backward. Addition of either gas must be minimized to attain the highest possible MCFC efficiency. Data being accumulated at other temperatures and at higher pressure will allow more detailed analysis.

2442 **(HTGL—231) Current distribution and nonuniformity effects in MHD disk generators.** Roseman, D.F. (Stanford Univ., CA (USA). High Temperature Gasdynamics Lab.). Aug 1982. Contract AC01-80ET15611. 156p. D. Order Number DE83000522.

Thesis.

Results of an experimental and analytical study of current distribution and nonuniformity effects in combustion driven MHD disk generators are presented. The overall objective of the study was to investigate the importance of these phenomena to baseload power generation. The experimental work consisted of combustion-driven steady state experiments with a peg-wall channel operated in a superconducting magnet. The peg-wall construction allowed current and voltage distributions to be measured. The channel was operated with plasma temperatures up to 2750 K and magnetic field strengths up to 5.5 Tesla. The magnitudes of the currents and voltages were reduced by significant loss mechanisms, primarily electrode losses and current leakage through the wall caused by potassium seed penetration of the castable ceramic between the pegs. A simple circuit model accounting for these losses was developed enabling comparisons to be made with analytical calculations. Under normal uniform electrical loading the distributions measured in the channel were uniform as expected. Nonuniform electrical loading was used to produce and measure effects on the current distribution that occur only in the presence of high magnetic fields as required for MHD power generation.

2443 **(IAE—3414/10) Superconducting magnet for performance testing MHD-channels of durable operation.** Polulyakh, E.P.; Kolyadin, N.M.; Krasil'nikov, E.V.; Klimenko, E.Yu.; Kejlin, V.E. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Atomnoj Ehnergii). 1981. 16p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82703151.

Test results and the description of main parts of design of the IM-114C superconducting magnet for MHD channels of durable performance are presented. Magnet winding consists of similar oval series-connected coils and fixed on the power frame. Each coil has nine two- layer sections with its own power binding Sections are wind by multicore galvanic bus with dimensions of 10x1 mm. As a superconducting material the NT-50 and the NTs-50 alloys are used. The copper is used as a stabilizing material. The cryostat of the JM-114C magnet represents a cylindrical Dewar flask with rectangular hole of the dimension of 275x600 mm for MHD-channel. While testing the 850 A critical current in the magnet was obtained which corresponds of 85% of the design current and 8.2 T magnetic field intensity in the center of the magnet. The obtained level of stability ensured supplying the current into the magnet with the rate of 0.5 A/s.

2444 (INIS-mf—7041, pp v) **MHD energy conversion as a method of more efficient fuel utilization.** Matev, M. (Vyzkumny Ustav Zavodu Energetickeho Strojirenstvi, Brno-Slatina (Czechoslovakia)). 1979. (In Czech). NTIS (US Sales Only), PC A02/MF A01.

In XIth conference of Czechoslovak power specialists. Part II. Conference proceedings.

The advantages are listed of the magnetohydrodynamic energy conversion: fuel savings, increased efficiency of power equipment, reduced amount of waste heat, lower requirements on cooling water, etc. The flow charts are given of two power plants with magnetohydrodynamic generators.

2445 **(MHD-III—82-101) Coal-fired MHD combustor development project: Phase IIIB. Second quarterly technical progress report, 1 May-17 August, 1982.** (TRW Energy Development Group, Redondo Beach, CA (USA)). 20 Aug 1982. Contract AC22-81PC40502. 22p. NTIS, PC A02/MF A01. Order Number DE83000143.

Portions of document are illegible.

The second quarterly technical progress report of the Coal-Fired MHD Combustor Development Project (Phase IIIB) presents the accomplishments for the period 1 May to 17 August 1982. The scope of work covered by this quarterly report relates to the successful completion in August 1982 of the integrated power train test at the AVCO Everett Research Laboratory (AERL). The coal-fired power generation test series marks another major milestone in the development of a commercial coal-fired open-cycle MHD power train. Progress during this reporting period included the following: combustor installation and flow train integration at AERL was accomplished without incident; 200 kW of power for 20 minutes was generated with a peak power output of 250 kW; achieved the project goal of greater than 70% slag recovery (85%) with Montana Rosebud coal; a successful correlation of PEM conductivity results with those measured by the MHD channel was attained; and a characterization of slagging coal-fired combustor/channel performance for future data correlation with oil-fired ash-injected combustor was achieved.

2446 **Electrical breakdown strength of alumina at high temperatures.** Yoshimura, M.; Bowen, H.K. (MIT, Cambridge, MA, USA). *Journal of the American Ceramic Society;* **64**: No. 7, 404-410(1981).

The dc electrical strength of sapphire and polycrystalline alumina was studies up to 1400/degree/C. The purpose of this investigation was to clarify the dielectric breakdown phenomena at high temperatures, because such ceramics are used as electric insulators between electrodes. 27 refs.

3005 Fuel Cells

2447 **(DOE/NASA/12726—17) Chemical and electrochemical behavior of the Cr(III)/Cr(II) half cell in the NASA Redox Energy Storage System.** Johnson, D.A.; Reid, M.A. (National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center; Spring Arbor Coll., MI (USA). Dept. of Chemistry). 1982. Contract AI04-80AL12726. 19p. (NASA-TM—82913; CONF-821015—2). NTIS, PC A02/MF A01. Order Number DE83000791.

From Electrochemical Society fall meeting; Detroit, MI, USA (17 Oct 1982).

The Cr(III) complexes in the NASA Redox Energy Storage System have been isolated and identified as $Cr(H_2O)_6^{+3}$ and $Cr(H_2O)_5Cl^{+2}$ by ion-exchange chromatography and visible spectrophotometry. The cell reactions during charge-discharge cycles have been followed by means of visible spectrophotometry. The spectral bands were resolved into component peaks and concentrations calculated using Beer's Law. During the charge mode $Cr(H_2O)_5Cl^{+2}$ is reduced to $Cr(H_2O)_5Cl^{+}$ and during the discharge mode $Cr(H_2O)_5Cl^{+}$ is oxidized back to $Cr(H_2O)_5Cl^{+2}$. Both electrode reactions occur via a chloride-bridge inner-sphere reaction pathway. Hysteresis effects can be explained by the slow attainment of equilibrium between $Cr(H_2O)_6^{+3}$ and $Cr(H_2O)_5Cl^{+2}$.

2448 **Fracture strength of a porous lithium aluminate structure for application in molten carbonate fuel cells.** Singh, R.N. (Argonne National Laboratory, Argonne, IL). *Ceramic Engineering and Science Proceedings;* **1**: No. 7-8, 500-507(1980). (CONF-800175—).

From 4. American Ceramic Society annual conference on composites and advanced materials; Cocoa Beach, FL, USA (20 Jan 1980).

Electrically insulating ceramics in the form of flat plates with controlled porosities are used in molten carbonate fuel cells to retain electrolyte at 925 K. For long fuel-cell lifetimes, these electrolyte tiles must be structurally stable under steady-state and thermal-cycling conditions. The results of fracture-strength measurements on sintered LiAlO2 structures with and without electrolyte over the temperature range of 300-925 K are presented. Predominantly brittle fracture was observed for porous samples up to 925 K however, the electrolyte-impregnated samples showed considerable ductility above 675 K. The results of a Weibull statistical analysis of the fracture-strength data are discussed.

32 ENERGY CONSERVATION, CONSUMPTION, AND UTILIZATION

REFER ALSO TO CITATION(S) 2381, 2434

2449 **(PB—82-195595) Energy R and D programme: energy conservation research. survey of results (1975-1979) and compilation of selected new projects (1979-1983).** Zegers, P. (Commission of the European Communities, Luxembourg). [nd]. 189p. NTIS PC E08/MF E08.

The projects (contracts) of the first energy conservation R and D program (1975-1979) dealt with: improvements to the insulation of buildings, heat-pumps, urban transport, recovery of residual heat, recycling of materials, production of energy from waste, industrial processes, and energy storage. A summary of the results and abstracts of the Final Reports are presented. Titles of R and D proposals selected for the second energy conservation R and D program 1979-1983 are listed under the following sector headings: domestic sector, heat-pumps, industrial processes, industrial components, transport, energy conversion, energy storage.

3201 Buildings

REFER ALSO TO CITATION(S) 1997, 2000, 2515, 2528, 2974

2450 (AD-A—113082/2) Leadless chip carrier packaging and cad/cam-supported wire wrap interconnect technology for subnanosecond ecl. Interim report 1 jul 80-30 jun 81. Gilbert, B.K. (National Building Research Inst., Pretoria (South Africa)). Nov 1981. 222p. NTIS, PC A10/MF A01.

This report describes the results of work conducted to develop rapid methods for designing and prototyping high-speed digital processor systems using subnanosecond emitter coupled logic (ECL). In Task I, we have begun a conversion of the design rules, interconnection protocols, special components, and standard logic panels developed during the first year for high-speed ECL-based digital processors from a technology based upon dual-in-line packages (DIP) to a technology based upon specially designed leadless ceramic chip carriers. This conversion was undertaken since it was learned during the first year that the DIP packages themselves are compromising the maximum performance levels of which the ECL dice are capable. We have also undertaken an extensive investigation of several possible approaches to increasing these operational maxima to an even greater extent than with our present design for new Leadless Ceramic Chip Carriers. Task 2 was to continue development of a comprehensive computer-aided design/computer-aided manufacturing (CAD/CAM) software package which would be specifically tailored to support the peculiar design requirements of processors operating in a high clock rate, transmission line environment. The CAD/CAM software package has been structured to be sufficiently flexible to assimilate advances in device and component technology, and to accept new sets of design rules resulting from advances in engineering design practice.

2451 (AD-A—113484/0) Effect of outside combustion air on gas furnace efficiency. Final report 18 Sep 80-15 Oct 81. Brisbane, T.E.; Hancock, K.L. (Johns-Manville Sales Corp., Denver, CO (USA). Research and Development Center). 15 Oct 1981. 117p. NTIS, PC A06/MF A01.

Retrofit enclosure of gas furnaces to supply outside combustion and dilution air may save up to 6 percent of natural gas usage in cold climates. The cost effectiveness of this retrofit should be calculated for each opportunity as installed costs will vary widely depending on local building codes and furnace location. A freezing hazard exists for water heaters and lines which might be encloseded with furnace.

2452 (BMFT-FB-T—82-023) Reduced energy reqirement for air conditioning by using air diffusion with air flow from floor to ceiling. Bach, H.; Dittes, W.; Mangelsdorf, R.; Detzer, R.; Jungbaeck, E.; Fitzner, K.; Radtke, W.; Soethout, F. (Bundesministerium fuer Forschung und Technologie, Bonn (Germany, F.R.)). Feb 1982. 324p. (In German). NTIS (US Sales Only), PC A14/MF A01. Order Number DE82750539.

The condition of the air in the occupied zone in airconditioned rooms is influenced by the mixing of supply air with room air. When supplying air from the ceiling there is a mixing all over the room, when supplying from the floor or from desks there is a mixing region only in the lower area. Above this their is warm air from which the return air is drawn. For air supply from below the cooling load can be decreased. In combination with the possible enthalpy difference between room air and supply air this decrease of the cooling load influences the necessary air rate. The interdependence of various air conditioning systems and various air temperatures is shown with a computer program. The load factor for various air distribution system at various cooling loads have been measured in a room of (8 x 5)m^2 x 3m. Experiments in a smaller model room (scale 1:3) showed how the heat was transported from the mixing region to the stratification region. The theoretically gained influence of the supply air jets of the height of the mixing region and on the load rate could be verified by the experiments. For the design of the fresh air rate, experience has been gained by measurements with tracegas (N_2O) in a third room. In comparing calculations the annual energy consumption has been computed for a building assuming various air conditioning systems and typical operation data. From experience with the existing systems the conclusions have been drawn how air distribution from floor to ceiling can be installed and operated.

2453 (BNL—31828) Instrumentation of the Brookhaven Natural Thermal Storage House. Ghaffari, H.T.; Jones, R.F. (Brookhaven National Lab., Upton, NY (USA)). 1982. Contract AC02-76CH00016. 10p. (CONF-821033—1). NTIS, PC A02/MF A01. Order Number DE83000267.

From Instrumentation Society of American international conference; Philadelphia, PA, USA (18 Oct 1982).

The Brookhaven Natural Thermal Storage House is a superinsulated energy-conserving house with various conservation and passive solar design features. The house is fully instrumented; 72 data points are scanned every 6 seconds and recorded every 15 minutes. The details on the datalogging system capable of receiving 48 analog, 16 digital, and 8 discrete inputs are discussed. The interfacing consists of a NEMA enclosure, terminal, modem, and magnetic tape recorder. The probes including the thermistors, dew point, wind direction and velocity; and pyranometer are specified. Finally, the method of installation and schemes of measuring the ambient, surface, and mass temperatures; dew point; and weather data are explained.

2454 (BNL—51540) Sulfuric acid/water chemical heat pump/chemical energy storage. Final report: Phases 1 and 2, October 1979 through September 1980; Phases 3 and 4, October 1980 through January 1982. (Rocket Research Co., Redmond, WA (USA)). Apr 1982. Contract AC02-76CH00016. 281p. NTIS, PC A13/MF A01. Order Number DE83001255.

Portions of document are illegible.

The sulfuric acid/water chemical heat pump/chemical energy storage (CHP/CES) concept was expanded to include previously unexplored applications, the most notable of which is the industrial chemical heat pump. A requirements analysis was completed which showed the CHP/CES application having the greatest near-term-commercialization potential in the form of a temperature amplification system. Another configuration, the HVAC system with or without diurnal storage was selected for further study. A verification test unit (VTU) was designed and is capable of demonstrating operation as an ICHP as well as an HVAC system. The VTU was fabricated and tested with a nominal power rating of 150,000 Btu/hr. Testing of the unit was directed at evaluating operational performance in the industrial waste heat upgrade mode. (LEW)

2455 (BNL—51545) Evaluation of the conservation potential of a refit energy management system (using a power line subcarrier) in a large, high-rise apartment complex. Phase II. Hirschfeld, H.E. (Hirschfeld (Herbert E.), Far Rockaway, NY (USA)). Sep 1981. Contract AC02-76CH00016. 88p. NTIS, PC A05/MF A01. Order Number DE83000798.

An energy conservation study of the application of an energy management system (EMS) utilizing power line subcarrier communication equipment was made in a large apartment building in New York, New York. The building utilized individual cooling and resistance heating units in each apartment. The EMS turned the individual units on and off (with override by tenants) on a schedule determined by the building operator. Summer savings were found to be 11%; winter savings were 20%. Annual savings were projected to be 19%. The study demonstrated the conservation value of power line subcarrier technology as an alternative to submetering. It also developed and evaluated control strategies for the system and served as a field test to accelerate commercialization of the technology.

2456 (BNL—51549) Development of the Schladitz oil burner. Schladitz, H.J. (Virginia Univ., Charlottesville (USA). School of Engineering and Applied Science). May 1982. Contract AC02-76CH00016. 29p. NTIS, PC A03/MF A01. Order Number DE83001260.

Conventional residential oil burners using No. 2 fuel oil are inefficient because (1) they do not have automatically variable flow rates to allow for easy adjustment in response to changes in load and (2) they burn with great difficulty, if at all, at low flow rates in the range of 0.1 to 0.2 gallons per hour (gph). Two conventional residential oil burners were successfully modified using the Schla-

ditz heat exchanger technology so that they burn with a stable, highly efficient flame. One burner operates at a fixed rate of 0.2 gph. The other can be operated at any flow rate from 0.1 to 0.6 gph. They demonstrate that slight, inexpensive modifications performed on conventional equipment make low-fixed-rate and variable-rate operation entirely practical.

2457 **(CONF-821055—1) Heat-activated heat-pump development and potential application of Stirling-engine technology.** Fairchild, P.D.; West, C.D. (Oak Ridge National Lab., TN (USA)). 1982. Contract W-7405-ENG-26. 43p. NTIS, PC A03/MF A01. Order Number DE83002134.

From 20. automotive technology development contractor coordination meeting; Dearborn, MI, USA (25 Oct 1982).

Portions of document are illegible.

Presented is a brief overview of the heat-activated heat pump technology development program being carried out with emphasis on the Stirling engine technology projects. The major projects are reviewed as they were formulated and carried out under the previous product development guidelines. The revised technology development focus and current status of those major hardware projects are discussed. The key issues involved in applying Stirling engine technology to heat pump equipment are assessed. The approach and planned future activities to address those issues are described. Also included are brief descriptions of two projects in this area supported by the Gas Research Institute (GRI).

2458 **(DOE/BP—140) Results of the Bonneville Power Administration weatherization and tightening projects at the Midway substation residential community.** Dickinson, J.B.; Grimsrud, D.T.; Krinkel, D.L.; Lipschutz, R.D. (Lawrence Berkeley Lab., CA (USA)). Feb 1982. Contract AC03-76SF00098. 83p. (LBL—12742). NTIS, PC A05/MF A01. Order Number DE83001522.

As part of a regional conservation program, the Bonneville Power Administration retrofitted 18 houses at its Midway substation in central Washington and monitored the results for a three year period. The 18 houses were divided into three groups, or cells. During the first year of the project, energy consumption was monitored but no changes were made to the houses. Prior to the second year of the project, Cell 2 received attic and crawlspace insulation, foundation sill caulking, and increased attic ventilation. Cell 3 received these retrofits plus storm windows and doors, and Cell 1 served as the control group. Before the beginning of the project's third year, each house in Cell 1 received 22 hours of infiltration reduction weatherization or house tightening. Each house in Cell 3 received 10 hours of this same type of weatherization. Cell 2 served as the control group for the house doctoring phase of the project. Energy consumption and weather data were monitored for the entire three year period. Before and after each set of retrofits, leakage area measurements were made using blower door fan pressurization, thereby allowing calculation of heating season infiltration rates. An energy use model correlating energy consumption with outside temperature was developed in order to determine improvements to the thermal conductance of the building envelope as a result of the retrofits. Energy savings were calculated based on the results of the energy use model and, as a check on these findings, the Computerized Instrumented Residential Analysis (CIRA) load calculation program developed at Lawrence Berkeley Laboratory provided a theoretical estimate of the savings resulting from the retrofits.

2459 **(DOE/BP—141) House doctor's manual.** Diamond, R.C.; Dickinson, J.B.; Lipschutz, R.D.; O'Regan, B.; Shohl, B. (Lawrence Berkeley Lab., CA (USA)). Oct 1982. Contract AC03-76SF00098. 66p. NTIS, PC A04/MF A01. Order Number DE83001523.

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The term house doctoring refers to a combination energy audit and energy-saving retrofit procedure. House doctoring analyzes areas of energy loss in which economically attractive conservation investments can be made, then locates and eliminates air infiltration sites by using special diagnostic instrumentation. An introduction and overview of house doctoring is provided, describing the nature of heat loss in buildings and the tools and techniques a house doctor uses to reduce them. A step-by-step walk-through of the house doctor visit is presented, describing the actual retrofit process, materials used, the order of repairs, the labor involved, and the important step of post-retrofit evaluation. Sample check lists and audit forms used in the procedure are provided. (LEW)

2460 **(DOE/CE—0035) US heat-pump research and development projects.** (USDOE Assistant Secretary for Conservation and Renewable Energy, Washington, DC). Aug 1982. 176p. NTIS, PC A09/MF A01. Order Number DE83000943.

This report is a compilation of 153 research project summary forms which provide descriptive data about individual R & D projects. Projects sponsored by DOE, EPRI, GRI and others are included for all the applications mentioned above. The document is intended to include all heat pump projects for which results are publicly available.

2461 **(DOE/CS/30208—T1) Data base and software for HVAC market analysis.** Coates, C.R.; French, R.L.; Weeks, D. (Planco, Inc., Dallas, TX (USA)). Sep 1981. Contract AC03-79CS30208. 43p. D. Order Number DE82022189.

The HVAC equipment types included in the data base are described and the data sources identified. The data base design and the data encoding system are described. The initial programs for analyzing information contained in the data base are described and examples of their output are given.

2462 **(DOE/R5/10294—2) Residential retrofit demonstration and resource center. Final technical report.** (Shawnee Solar Project, Carbondale, IL (USA). Demonstration and Resource Center). Sep 1982. Contract FG02-81R510294. 6p. NTIS, PC A02/MF A01. Order Number DE83000674.

The goal of the grant program was to retrofit a fairly typical Southern Illinois residential structure for use as a community demonstration and resource center. The retrofitting process and the resulting energy efficient structure were to provide opportunities for community education in appropriate technologies for residential energy efficiency and solar utilization. The Center is functioning as an integral part of the community's energy efficiency efforts. The city of Carbondale is utilizing the Center to complement its energy education program and Southern Illinois University is beginning to coordinate its alternative energy efforts from an office located in the Center. More specific objectives of the grant program have been accomplished with the help of numerous volunteers and several corporate contributors. Some specifications for the retrofit had to be adapted to the physical constraints imposed by the actual structure and the need to demonstrate cost effective applications. Maintaining adequate funding for staffing the Center continues to be a problem. Nevertheless, it is open (9:00 to 5:00, weekdays) and functioning as a community-based regional resource center. The library is in daily use and numerous workshops and other special programs are conducted through the Center.

2463 **(NZERDC-P—58) Applications of heat pumps in the USA, UK, and Europe.** Carrington, C.G. (New Zealand Energy Research and Development Committee, Auckland). Jul 1982. 21p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82905454.

Heat pump applications in the United Kingdom, USA, and Europe are briefly surveyed. Emphasis is placed on applications which are relevant to New Zealand's needs. Specific topics discussed include: applications of heat pumps in buildings, industrial applications for drying and heat recovery, and mechanical vapor recompression. Firms and institutions surveyed are listed. (LEW)

2464 **(ORNL/TM—8486) Status of the Residential Conservation Service Program in selected states as of December 1981.** Frogge, L.M.; Ehrenshaft, A.R.; Morris, L.E. (Oak Ridge National Lab., TN (USA)). Sep 1982. Contract W-7405-ENG-26. 56p. NTIS, PC A04/MF A01. Order Number DE83001634.

The primary objective of the study reported was to collect information concerning Residential Conservation Service (RCS) and similar residential audit programs to determine the implementation status of the RCS programs in various parts of the country as of December 1, 1981. Common experiences, problems, and treat-

ment of RCS and other residential audit programs are briefly overviewed, and then the interview findings are discussed on a state-by-state basis for each of the eleven states contacted. The program structure and status are described for each state, including the non-regulated utility programs, unique features, and problems and impacts. The 11 states are: California, Connecticut, Delaware, Iowa, Michigan, New Jersey, New York, Oregon, Rhode Island, South Carolina, and Texas. Appended are an interview guide and a table of program coverage. (LEW)

2465 **(PB—82-185851) Research in south africa aimed at energy conservation in building and buildings.** Webb, T.L. (National Building Research Inst., Pretoria (South Africa)). 22 Oct 1979. 19p. NTIS, PC A02/MF A01.

The present day energy consumption profile in the building process and in buildings is sketched, some of the more significant research in progress is briefly outlined and finally some specific suggestions are made as to what the building community can and should do about it.

2466 **(PB—82-190984) The minimisation of the power consumption of a thermodynamic heat pump by a microprocessor based control system. Final report.** Wilson, D.R.; Green, R.K.; Neale, D.F.; Searle, M.; Bird, K.E. (Commission of the European Communities, Luxembourg). 1981. 98p. NTIS PC E05/MF E05.

To study the performance of a variable capacity heat pump and to implement control strategies that will minimize the energy consumption of the system over a range of operating conditions, an electrically driven air to water heat pump has been designed and tested. The performance characteristics of this advanced system when operating both under full load and part load conditions have been established and its ability to conserve energy when compared to a conventional system has been demonstrated. Results show that an improvement in energy savings of around 9% can be achieved. Further to the energy savings of the system, lower power consumption is required at start up when using a capacity controlled heat pump, thus increasing its possible application in the domestic sector.

2467 **(PB—82-191107) Frosting and defrosting behaviour of outdoor coils of air-source heat pumps. Final report.** Bouma, J.W.J. (Commission of the European Communities, Luxembourg). 1981. 109p. NTIS, PC A05/MF A01.

Improvement of the COP of an air-source heat-pump may be obtained by means of improved design and operation of the coils under frosting conditions. The aim of the investigation was to get an insight into the factors influencing coil behavior and to make recommendations regarding design and operation of the coils.

2468 **(PB—82-195124) Determination of electrical demand for V.A. medical buildings. volumes i and ii. Research study report.** (MET Electrical Testing Co., Inc., Baltimore, MD (USA)). Feb 1982. 615p. NTIS, PC A99/MF A01.

The project was undertaken to determine the actual values of the electrical loads at six major types of Veterans Administration buildings and to produce accurate design values for future use. From the electrical loads measured and recorded at nineteen separate buildings, design and planning values related to the electrical needs of each of the buildings categories were developed. These values were calculated on a Watt Per Square Foot basis and correlated to various factors including climate, construction, occupancy, operational procedures and building design.

2469 **(PB—82-200346) Energy efficiency of buildings in cities.** (Office of Technology Assessment (U.S. Congress), Washington, DC). Mar 1982. 373p. NTIS, PC A16/MF A01.

The potential for increased energy efficiency in buildings found in cities is examined from two perspectives: that of the energy expert who assesses technical opportunities for improved energy efficiency, and that of the real estate expert who evaluates the financial attractiveness of real estate investment opportunities. The study categorizes existing buildings according to their technical retrofit potential; it also groups building owners according to the likelihood that they will invest in retrofits. It assesses the prospects for large-scale stimulus of building retrofit by private businesses, public utilities, and city and State governments. Several options for Federal policies towards building retrofit are provided. The study also includes an analysis of the technical and economic feasibility of district heating in cities.

2470 **(PB—82-203092) Application of structural measures for energy conservation in existing buildings.** (Statens Raad foer Byggnadsforskning, Stockholm (Sweden)). Feb 1982. 96p. NTIS, PC A05/MF A01.

Illustrated are the measures which can be carried out on building elements in order to save energy. The publication describes different methods and states advantages and disadvantages as well as suitable combinations of measures. The emphasis has been placed on the measures which are easiest to carry out and are consequently usually the most economical. However, the economics of different measures should be investigated for each individual case. The publication shows how this can be done.

2471 **(PNL-SA—10584) Implementation of voluntary residential energy-efficiency rating/labeling systems.** Hendrickson, P.L. (Pacific Northwest Lab., Richland, WA (USA)). 1982. Contract AC06-76RL01830. 20p. (CONF-820849—11). NTIS, PC A02/MF A01. Order Number DE83002002.

From Summer study in energy efficient buildings; Santa Cruz, CA, USA (22 Aug 1982).

Voluntary residential energy-efficiency rating systems are receiving increasing attention. The greatest number of rating systems have been implemented by investor-owned utilities affiliated with the National Energy Watch Program of Edison Electric Institute. Other utility programs and programs initiated by units of local government have also been implemented. The programs offer the potential of reduced energy consumption and enhanced marketplace recognition of energy efficient properties by providing energy efficiency information. This paper provides an introduction to the concept, identification of likely beneficiaries, identification and discussion of the three principal categories of rating systems, a summary of existing implementation efforts, and an identification of implementation and technical issues meriting research. The issues of potential liability for negligently performed ratings and the relationship of a rating to residential energy audits are also discussed.

2472 **(PNL-SA—10644) Monitoring energy use in restaurants.** Mazzucchi, R.P. (Pacific Northwest Lab., Richland, WA (USA)). 1982. Contract AC06-76RL01830. 9p. (CONF-820849—10). NTIS, PC A02/MF A01. Order Number DE83002008.

From Summer study in energy efficient buildings; Santa Cruz, CA, USA (22 Aug 1982).

Reported is a project to collect and analyze empirical data on the energy usage of various types of food-service operations. Seven free standing facilities constructed after 1973 and having process equipment representative of particular food service types have been selected for metering. Installation of monitoring equipment to measure energy usage for lighting, heating, cooling, and ventilating restaurants, as well as cooking, refrigeration, and sanitation will be completed in August of 1982. Microcomputers installed in each of the facilities are programmed to store cumulative sensor outputs every 15 minutes for energy usage, interior temperatures, and key microclimatic parameters. They will also conduct some real-time data analysis and automatically transmit data to a mainframe computer at Penn State on a daily basis for review and additional analyses. This paper describes the overall program plan and presents information on the instrumentation plans, data acquisition system and data analysis procedures.

2473 **(SAI—77-858-LJ) Energy-efficiency program for room air conditioners, central air conditioners, dehumidifiers, and heat pumps. Final report.** Rettberg, R.J.; Smith, C. (Science Applications, Inc., La Jolla, CA (USA)). Mar 1978. Contract AC01-76CS28648. 426p. NTIS, PC A19/MF A01. Order Number DE83001244.

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A detailed study was performed to support the development of energy efficiency improvement targets for room air conditioners,

central air conditioners, heat pumps, and dehumidifiers. The evaluation methodology and results of the program are reported. First presented is a condensed discussion of the program approach and results. Then the test methods, data, data reduction, data analyses, and other detailed considerations in support of the program results are discussed in detail. Test data and market data are tabulated for the room air conditioners, central air conditioners, heat pumps, and dehumidifiers. (LEW)

2474 **Analysis of hospital energy audits.** Hirst, E. (Oak Ridge National Lab., TN). *Energy Policy;* **10**: No. 3, 225-232(Sep 1982). Contract W-7405-ENG-26.

Oak Ridge Associated Universities (ORAU) staff conducted energy audits at 48 hospitals in four states between 1978 and 1980. The energy audits show an average potential energy saving of almost 100 kBtu/ft² (1.1 GJ/m²), a 20% reduction. The variation among hospitals is large; the range is from 6% to 49% of baseline energy use. The cost to implement all these conservation practices and measures is quite low, only 25 cents/ft² ($2.65/m²), which implies an average payback period of only one year. Analysis of the audit results shows that the potential energy saving increases with baseline energy use and decreases with fuel price. This suggests that large energy savings will be found at hospitals that are particularly energy-intensive and that have low fuel prices. 29 references, 4 figures, 4 tables.

2475 **Inequities in domestic energy use: some determinants.** Kalma, J.D. (CSIRO, Div. of Land Use Research, Canberra City, Australia); Crossley, D.J. *Energy Policy;* **10**: No. 3, 233-243(Sep 1982).

The main determinants of differences in residential energy use for space heating and space cooling arise from location, structure, and design of dwelling - and human behavior. International, inter-regional and inter-household comparisons show that most available statistical data on residential energy use hide great complexity and must be disaggregated to identify real differences. Some differences are increasingly recognized as inequitous, that is, as disadvantageous to one or more groups and difficult or impossible to remove. Government energy-policy mechanisms must be developed that do not increase existing inequities in the energy field, or create new ones. 43 references, 2 figures, 6 tables.

2476 **(PB—82-188269) Investigation on the economic possibilities regarding the reduction of energy intensity for electrical household appliances. Volume 1.** Orth, G. (Elektowaerme-Inst. e.V., Essen (Germany, F.R.)). Oct 1980. Translation of Untersuchungen zu den wirtschaftlichen Moeglichkeiten einer Verringerung der Energieintensitaet bei elektrischen Haushaltsgeraeten (Band 1), n.p., n.d. See also German version N81-30486/7.;. 182p. NTIS, PC A09/MF A01.

Investigation results concerning the analysis of the energy application for electrical household appliances have not been available up to now. The investigation had the purpose of analyzing the energy consumption of energy-intensive household appliances so that energy possibilities with regard to the effectiveness may be developed. The parts of the effective and of the lost energy are being experimentally determined for the following appliances: large scale hot water tank, washing machine, laundry drier, dish washer, electric hearth, coolers and refrigerators. The influence of the utilization habits on the specific energy consumption and the relationship between the energy application and the application properties are being investigated. On the basis of the investigation results the different possibilities of energy conservation are shown, together with some aspects of economical operation. On the basis of the investigation results also, the potential of the energy conservation, related to practical consumption values, is estimated at about 5-40%, depending on the appliance.

2477 **(PB—82-212861) Experimental investigations about using the earth as a heat storage medium and as a heat source for heat pumps. Final report.** Nievergeld, P.; Koppenol, A.; Van der Brugh, J. (Commission of the European Communities, Luxembourg). [nd]. 86p. NTIS PC E05/MF E05.

Experiments have been carried out to verify the TNO model for horizontal earth heat exchangers under practical conditions and to compare it with a model developed by Laborelec (Belgium). The characteristics of the heat exchanger chosen for the experiment are described. For a full heating season (1.10.79 till 26.5.80) heat extraction from and temperature distribution in the earth around the tubes of the heat exchanger were measured. During the summer period (26.5.80 till 1.10.80) the temperature recovery of the earth was recorded. Measurements were carried out for undisturbed earth, single horizontal tubes, single vertical tubes, and horizontal tube bundles, and comparisons were made between the TNO model, undisturbed earth, single horizontal tubes and horizontal bundles. A horizontal tube earth/water heat-pump system for a dwelling house has been costed.

2478 **(EUR—7064-DE) Development of an absorption heat pump aggregate, operated by a primary energy source, for the heating of domestic dwellings.** Schrader, K.H. (Commission of the European Communities, Luxembourg). [nd]. 47p. (In German). NTIS PC E03/MF E03.

The aim was to develop the prototype of a bivalently driven heat pump operating at ambient temperatures down to -4C, delivering heat up to 90C, and being economical in the fuel consumption of its prime mover; at lower temperatures an integrated conventional heating system was to be activated. The working medium was to be a safe two-component mixture of the halocarbon refrigerant R 22 and solvent E 181 (tetraethyleneglycol dimethylether), but provision has been made for a variant using either water/water or air/water. The planning, design and construction of the prototype are reported as well as the start-up in January 1979. Material and component failures were investigated; the remedies found are described in detail. A second prototype has been designed and is being developed for eventual installation in an actual dwelling house.

3202 Transportation

REFER ALSO TO CITATION(S) 2533, 2534

2479 **(ANL/EES-TM—188) Vehicle characterization for the TAPCUT project: materials, energy, and residuals of manufacture for vehicles, fuels, and rights-of-way.** Hudson, C.L.; Putnam, E.S.; Hildestad, R. (Interplan Corp., Santa Barbara, CA (USA)). Nov 1981. Contract W-31-109-ENG-38. 444p. NTIS, PC A19/MF A01. Order Number DE83000887.

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Two productive conservation strategies were designed to save energy in urban passenger transportation when substituted for policies now in place. A reference set of impact forecasts was then prepared for these two strategies. One conservation strategy stressed group travel, e.g., transit and carpooling, while the other promoted individual travel in private automobiles. Travel demand analysis was performed for each of three typical cities under policies now in place and forecast to continue, and under the alternative strategies, i.e., Group Travel Strategy and Individual Travel Strategy. Environmental impact analysis of the forecast travel demand under each strategy was city-specific and included estimation of air and water pollutant burdens along with their associated impacts on human health. Traffic safety impacts were also estimated. Socioeconomic impacts due to vehicle use and vehicle production were assessed. Impacts on physical environment, resources, health, and safety caused by vehicle and fuels production and infrastructure construction were also addressed. The final step was the overall comparison of policy-driven results to the results obtained under the In-Place Policy set.

2480 **(DOE/CS/50152—1) Motor vehicle operator fuel-conservation feedback device. Final technical report.** Fazio, C.; Cooksey, R.; Hartley, C.; O'Neil, F. (Bendix Corp., Englewood, CO (USA). Energy, Environment, and Technology Office). Aug 1982. Contract AC08-81CS50152. 144p. NTIS, PC A07/MF A01. Order Number DE83000964.

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A summary is given of the work performed to evaluate a number of existing fuel and vacuum monitoring devices from a technical and human factors viewpoint; the experimental analysis of the device presentation from the operator (user) standpoint both on

the basis of subjective preference and objective driving performance; and the utilization of these results to incorporate the best features of these devices into the design of a vehicle operator fuel conservation feedback unit. The laboratory and human factors evaluations are described, the road test experiments are detailed, and the design and development of a retrofit unit is presented along with results of the breadboard unit construction and evaluation.

2481 **(GAO/PAD—82-39) Assessing the feasibility of converting commercial vehicle fleets to use methanol as an offset in urban areas.** (General Accounting Office, Washington, DC (USA). Program Analysis Div.). 11 Jun 1982. 10p. General Accounting Office, PO Box 6015, Gaithersburg, MD 20760.

Results indicate that, at the present time, converting commercial fleets to use methanol does not appear to be a cost-effective strategy for obtaining offsets. Cost effectiveness estimates for such a strategy range from about $20/lb of NOx reduction to about $760/lb of NOx reduction, based on a number of assumptions. Though California's special tax credit for methanol conversions could reduce the expense of that strategy to $7/lb of NOx reduced in that State, those special circumstances should not be used for purposes of reaching general conclusions about the relative feasibility and attractiveness of a methanol offset strategy. Obtaining offsets by retrofitting stationary sources could vary from about $0.20/lb to $8.50/lb of NOx reduction, according to our information.

2482 **(NP—2904430) Energy optimized automatic public transportation system with a microprocessor in the vehicle.** Tchinda, A. (Technische Univ. Braunschweig (Germany, F.R.). Fakultaet fuer Maschinenbau und Elektrotechnik). 11 Sep 1980. 167p. (In German). NTIS (US Sales Only), PC A08/MF A01. Order Number DE82904430.

Thesis.

The matter with energy optimizing running is, that the train reaches the final state (target station) from the initial state (original station) in time with consideration of the given safety demands and other limitations and the consumed energy has its minimal value. This principle was extended for a driverless train operation in a sense that the optimization problem was formulated new and solved with regards to extensive secondary conditions as: velocity-dependent train and braking power and motion resistance force, path-dependent maximum velocity of the route and hazardous points. The algorithms for optimal vehicle control were developed by means of E. Bellmann's dynamic programming with regards to the secondary conditions mentioned above.

2483 **(ORNL/CON—99) Evaluation of ridesharing programs in Michigan.** Kulp, G.; Tsao, H.J.; Webber, R.E. (Oak Ridge National Lab., TN (USA)). Oct 1982. Contract W-7405-ENG-26. 184p. NTIS, PC A09/MF A01. Order Number DE83001716.

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The design, implementation, and results of a carpool and vanpool evaluation are described. Objectives of the evaluation were: to develop credible estimates of the energy savings attributable to the ridesharing program, to provide information for improving the performance of the ridesharing program, and to add to a general understanding of the ridesharing process. Previous evaluation work is critiqued and the research methodology adopted for this study is discussed. The ridesharing program in Michigan is described and the basis for selecting Michigan as the evaluation site is discussed. The evaluation methodology is presented, including research design, sampling procedure, data collection, and data validation. Evaluation results are analyzed. (LEW)

2484 **(PB—82-148750) Application for certification 1982 model year light-duty vehicles - American Motors Corporation (Renault).** (American Motors Corp., Detroit, MI). 1982. 2315p. NTIS PC $120.75/MF $10.25.

Every year, each manufacturer of passenger cars, light-duty trucks, motorcycles, or heavy-duty engines submits to EPA an application for certification. In the application, the manufacturer gives a detailed technical description of the vehicles or engines he intends to market during the upcoming model year. These engineering data include explanations and/or drawings which describe engine/vehicle parameters such as basic engine design, fuel systems, ignition systems and exhaust and evaporative emission control systems. It also provides information on emission test procedures, service accumulation procedures, fuels to be used, and proposed maintenance requirements to be followed during testing. Section 16 of the application contains the results of emission testing, a statement of compliance to the regulations, production engine parameters, and a Summary Sheet Input Form on which issuance of a Certificate of Conformity is based.

2485 **(PB—82-148768) Application for certification 1982 model year light-duty vehicles - Chrysler Corporation.** (Chrysler Corp., Detroit, MI (USA)). 1982. 2520p. NTIS PC $131.00/MF $10.75.

Every year, each manufacturer of passenger cars, light-duty trucks, motorcycles, or heavy-duty engines submits to EPA an application for certification. In the application, the manufacturer gives a detailed technical description of the vehicles or engines he intends to market during the upcoming model year. These engineering data include explanations and/or drawings which describe engine/vehicle parameters such as basic engine design, fuel systems, ignition systems and exhaust and evaporative emission control systems. It also provides information on emission test procedures, service accumulation procedures, fuels to be used, and proposed maintenance requirements to be followed during testing. Section 16 of the application contains the results of emission testing, a statement of compliance to the regulations, production engine parameters, and a Summary Sheet Input Form on which issuance of a Certificate of Conformity is based.

2486 **(PB—82-148784) Application for certification 1982 model year light-duty vehicles - Ford Motor Company.** (Ford Motor Co., Dearborn, MI (USA)). 1982. 4930p. NTIS PC $251.50/MF $17.00.

Every year, each manufacturer of passenger cars, light-duty trucks, motorcycles, or heavy-duty engines submits to EPA an application for certification. In the application, the manufacturer gives a detailed technical description of the vehicles or engines he intends to market during the upcoming model year. These engineering data include explanations and/or drawings which describe engine/vehicle parameters such as basic engine design, fuel systems, ignition systems and exhaust and evaporative emission control systems. It also provides information on emission test procedures, service accumulation procedures, fuels to be used, and proposed maintenance requirements to be followed during testing. Section 16 of the application contains the results of emission testing, a statement of compliance to the regulations, production engine parameters, and a Summary Sheet Input Form on which issuance of a Certificate of Conformity is based.

2487 **(PB—82-148917) Application for certification 1982 model year heavy-duty vehicles - Cummins Engine.** (Cummins Engine Co., Inc., Columbus, IN (USA)). 1982. 644p. NTIS PC $37.25/MF $5.75.

Every year, each manufacturer of passenger cars, light-duty trucks, motorcycles, or heavy-duty engines submits to EPA an application for certification. In the application, the manufacturer gives a detailed technical description of the vehicles or engines he intends to market during the upcoming model year. These engineering data include explanations and/or drawings which describe engine/vehicle parameters such as basic engine design, fuel systems, ignition systems and exhaust and evaporative emission control systems. It also provides information on emission test procedures, service accumulation procedures, fuels to be used, and proposed maintenance requirements to be followed during testing. Section 16 of the application contains the results of emission testing, a statement of compliance to the regulations, production engine parameters, and a Summary Sheet Input Form on which issuance of a Certificate of Conformity is based.

2488 **(PB—82-148925) Application for certification 1982 model year heavy-duty vehicles - Ford Motor Company.** (Ford Motor Co., Dearborn, MI (USA)). 1982. 867p. NTIS PC $48.50/MF $6.50.

Every year, each manufacturer of passenger cars, light-duty trucks, motorcycles, or heavy-duty engines submits to EPA an application for certification. In the application, the manufacturer gives a detailed technical description of the vehicles or engines he intends to market during the upcoming model year. These engineering data include explanations and/or drawings which describe engine/vehicle parameters such as basic engine design, fuel systems, ignition systems and exhaust and evaporative emission control systems. It also provides information on emission test procedures, service accumulation procedures, fuels to be used, and proposed maintenance requirements to be followed during testing. Section 16 of the application contains the results of emission testing, a statement of compliance to the regulations, production engine parameters, and a Summary Sheet Input Form on which issuance of a Certificate of Conformity is based.

2489 **(PB—82-178534) EPA evaluation of the 'Pass Master Vehicle Air Conditioner Cut-Off' Device. Technical report.** Penninga, T.J. (Environmental Protection Agency, Ann Arbor, MI (USA)). Aug 1980. 96p. (EPA-AA-TEB—511-80-5). NTIS, PC A05/MF A01.

The conclusions of the EPA evaluation of the 'Pass Master Vehicle Air Conditioner Compressor Cut-Off Device' under the provisions of Section 511 of the Motor Vehicle Information and Cost Savings Act are announced. The Pass Master device disengages the air conditioning compressor during hard vehicle acceleration modes. The reduced engine loading will result in some fuel savings.

2490 **(PB—82-192337) New York City Police Department automated fuel monitoring system. Volume I: overview.** McGrath, W.J.; McNamara, M.M. (Naval Underwater Systems Center, New London, CT (USA). New London Lab.). Oct 1981. 18p. NTIS, PC A02/MF A01.

The New York City Police Department's (NYCPD) automated fuel monitoring system was initiated in 1977 by the Naval Underwater Systems Center (NUSC) and became operational in September 1981. For this study, a flowchart was prepared of the existing manual fuel control system from which it was revealed that: (1) all transactions were manually recorded in a gasoline and oil receipt book by the pump attendant and were signed by the department vehicle operator; (2) the system required the services of a full-time pump attendant for at least two of the three daily duty shifts; and (3) each precinct was responsible for reordering its own fuel from the vendor. After a data collection effort, a number of recording errors were noted and the major system problems were identified. An automated fuel system was proposed and a pilot project was undertaken to determine the system's effectiveness. System design, specifications, configuration, and implementation are discussed in the report, and the system's cost and benefits are noted.

2491 **(PB—82-192352) New York City Police Department automated fuel monitoring system. Volume II: documentation report.** McGrath, W.J.; McNamara, M.M. (Naval Underwater Systems Center, New London, CT (USA). New London Lab.). Nov 1981. 366p. NTIS, PC A16/MF A01.

The New York City Police Department's (NYCPD) automated fuel monitoring system was designed and implemented for NYCPD as a major aspect of the Naval Underwater System Center's technology transfer program. The system, which is the largest of its kind installed to date, provides complete control of fuel usage for an agency with 4,000 motor vehicles and 25,000 vehicle operators, and can be scaled up or down to meet the needs of other governmental units. Estimated annual cost savings to NYCPD are $2,000,000. Other benefits of the new system are: (1) central control of fuel ordering and dispensing which ensures fewer sites out of fuel and for shorter periods; (2) less out-of-precinct travel because personnel do not have to go from site to site looking for gas; and (3) control of the total fuel operation, both for management and accounting purposes.

2492 **(PB—82-174905) Fuel consumption testing of heavy goods vehicles.** Williams, T.; Simmons, I.C.P.; Jacklin, D.J. (Transport and Road Research Lab., Crowthorne (UK)). [nd]. 50p. (TRRL-SUPPLEMENTARY—687). NTIS, PC A03/MF A01.

Described is a variety of fuel consumption tests on goods vehicles, many of which were done in the course of development of a simulation of vehicle operation. The problem of obtaining measurements during normal road operation which are consistent enough to reveal the effect of a modification which might give a small percentage improvement in fuel consumption is demonstrated. A track test procedure is described, which, together with controlled motorway runs, overcomes this problem. The results of such tests to determine the effect of aerodynamic modifications, thermostatically controlled fans and shutters, the effect of gear selection and of tire characteristics on fuel productivity are presented. The influence of route upon fuel consumption has been demonstrated as far as possible under the variable conditions during normal road use.

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REFER ALSO TO CITATION(S) 1576, 1600, 1858, 1859, 1860, 1861, 1865, 1896, 1928, 1930, 2431, 2454, 2463, 2463

2493 **(BMFT-FB-T—82-022) Microelectronics cut energy consumption.** Angerer, G.; Boehm, E.; Hauser, U.; Jochen, E.; Mannsbart, W.; Mentzel, T.; Diehl, R.; Konstanzer, M.; Oswald, D.; Wiehl, H.E. (Bundesministerium fuer Forschung und Technologie, Bonn (Germany, F.R.)). Feb 1982. 540p. (In German). NTIS (US Sales Only), PC A23/MF A01. Order Number DE82750538.

Sensors, integrated circuits, and actuators are the constituents of microelectronic systems which are increasingly applied for the control of energy consuming processes to reduce energy losses. The energy saving potential of microelectronics was investigated in various sectors of secondary energy consumption, viz. heating, electrical household equipment, road traffic, selected lines of business, hot-water and steam generation as well as electrical motor drives (a total of about 75 per cent of the secondary energy consumption in the Federal Republic of Germany). As a result, potential energy savings, will reduce the demand for primary energy by 265 to 290 billions of kilowatt-hours in 1995 (8 to 9 per cent of the total demand of the Federal Republic of Germany). To materialize these energy savings extensive R + D work is required, especially in the field of cheap and reliable sensors and actuators which have to be compatible with LSI circuits.

2494 **(BMFT-FB-T—82-027) Possibilities of energy conservation in the ceramic industry.** Hoffmann, U.; Marchand, H.; Neisen, H.J.; Schneider, W.; Schwaemmlein, W.; Weibel, G. (Bundesministerium fuer Forschung und Technologie, Bonn (Germany, F.R.)). Mar 1982. 188p. (In German). NTIS (US Sales Only), PC A09/MF A01. Order Number DE82750552.

The ceramic industry belongs to the energy-intensive sectors of economy. The political and macroeconomic as well as the microeconomic energy situation therefore requires the available energy to be used as economically as possible. The effect of specific energy conservation measures can be assessed only if a critical and comparative evaluation can be made on the basis of a detailed classification of energy consumption and energy costs. Therefore, product- and process-related data, supplemented by measurements on the most energy-intensive units (driers, kilns), were collected in reference companies of the tile, sanitary ware, refractory and tableware porcelain sectors. Analysis of the data reveals the most important weak points in terms of energy consumption. Possibilities of reducing energy consumption in the manufacture of ceramic products are identified. At the present state of the art, energy savings of up to 20 percent can be expected in individual cases. In the long term, the use of alternative technologies may result in savings of 50 percent and more. In all cases where relevant concepts are available, it is imperative to create the conditions for the implementation of such techniques in the near future.

2495 **(BMFT-FB-T—82-042) Potential of electric power generation from industrial waste heat in the German chemical and petrochemical industries as well as petroleum-refineries.** Lambrecht, J.; Karsten, D. (Bundesministerium fuer Forschung und Technologie, Bonn (Germany, F.R.)). Apr 1982. 123p. (In German). NTIS (US Sales Only), PC A06/MF A01. Order Number DE82750640.

For the chemical and petrochemical industries as well as petroleum refineries of the Federal Republic of Germany waste heat sources were determined, which can be utilized for power generation by means of organic Rankine cycle systems. The technical potential is approximately 500 MWsub(el), 100 MW each in the chemical and petrochemical industries and 300 MW in the refineries. Atmospheric distillation and ethylene production are the most important applications for ORCS, each with a technical potential of 100 MW. The economic potential can only be determined by an analysis of each individual situation. However, a general analysis of the economies of ORCS seems to indicate that there are a considerable number of applications for which the introduction of ORCS should be economically feasible.

2496 **(CONF-820814—34) Highly efficient arc-welding power supply.** Bradburn, H.F.; Donaldson, A.D. (EG and G Idaho, Inc., Idaho Falls (USA)). 1982. Contract AC07-76ID01570. 3p. NTIS, PC A02/MF A01. Order Number DE83000562.

From 17. Intersociety Energy Conversion Engineering conference; Los Angeles, CA, USA (8 Aug 1982).

Of the various methods for achieving significant energy savings in electric arc welding, improvement in power supply efficiency presents the greatest potential for virtually all welding processes. This paper discusses the concept of inverter technology applied to arc welding power supplies, and reviews completed projects jointly funded by industry and the Department of Energy that were undertaken to develop and accelerate implementation of this technology.

2497 **(CONF-821060—1) Potential of PFB- and AFB-packaged industrial boilers.** Fox, E.C.; Graves, R.L.; Kahl, W.K.; Thomas, J.F. (Oak Ridge National Lab., TN (USA)). 1982. Contract W-7405-ENG-26. 22p. NTIS, PC A02/MF A01. Order Number DE83001964.

From International symposium on conversion to solid fuels; Newport Beach, CA, USA (26 Oct 1982).

Industry is the largest energy consuming sector of our economy. It is the largest user of natural gas and a large consumer of oil. The fact that oil and gas account for over four times the contribution of coal in annual energy consumed by industrial boilers suggests that a genuine opportunity exists to displace these fuels in quantity. Steam production, in particular, is one application where technology exists to burn coal, but a sustained conversion to coal is not taking place. To make coal combustion more acceptable and less expensive to industry, the development of packaged coal-fired systems should be of high priority. Fluidized bed coal combustion (FBC) can perhaps satisfy this need, chiefly because its improved heat transfer characteristics effectively shrink the furnace volume. Furthermore, if the bed is operated under pressure, then another size reduction is realized. A preliminary study of the feasibility of packaging coal-fired fluidized bed boilers for industry was performed. The study focused on and compared atmospheric fluidized beds (AFB) and pressurized fluidized beds (PFB). The PFB boiler module appears to have potential for packaging, while the AFB boiler was found to have some inherent characteristics that may jeopardize its potential as a packaged system in the same size range. A conceptual cost estimate is presented with an economic assessment that brings into perspective the impact that development of large coal-fired packaged-boilers could have on the use of oil and gas in industry.

2498 **(DOE/CS/40090—T1) Wet fractionation of forage to reduce energy requirements of dehydration. Final technical report, August 12, 1978-April 30, 1982.** Edwards, R.H.; Kohler, G.O. (Department of Agriculture, Albany, CA (USA). Western Regional Research Center). 1 Jul 1982. Contract AI01-78CS40090. 76p. NTIS, PC A05/MF A01. Order Number DE83000103.

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Wet processing fractionates fresh alfalfa into leaf protein concentrate (LPC), alfalfa solubles, and press cake products. The process can reduce energy consumption compared to normal dehydration of freshly chopped alfalfa by recovering sensible and latent heat from the dryer exhaust gases using a gas recycle system and waste heat evaporator, and by reducing the water evaporated per ton of product produced. A conventional commercial alfalfa dehydration plant (Valley Dehydrating Company, Sterling Co; VDC) was modified to an LPC operation with a design capacity of 30 tons of chopped alfalfa per hour. During the experimental period the plant operated at 15 to 24 tons/h, and produced an average LPC yield of 12.8% (dry basis). The VDC plant consumed 25% less total energy (29% less natural gas; 108% more electrical energy) than that estimated for conventional dehydration of chopped alfalfa. Energy savings were lower than anticipated because of inefficiencies resulting from plant operation at less than design capacity. Based on the experience at VDC, future LPC plants are projected to reduce overall energy consumption by 35% (39% less natural gas; 63% more electrical energy) as compared to conventional dehydration. The VDC products were marketed readily; the press cake was sold to cattle feeders at a price equivalent to dehydrated alfalfa, and the LPC to a broiler producer at prices varying from $430 to $590/ton. Animal performance trials using VDC produced products were highly satisfactory. Projected current cost of a new LPC plant processing 40 tons of chopped alfalfa per hour is 4.7 million dollars; the cost of converting an existing 20 ton/h dehydration plant to a 40 ton/h LPC plant is estimated at 3.6 million dollars. The calculated rate of return on investment for the new plant was 12.0, 26.2 and 40.4% for operating seasons of 130, 180 and 230 days, respectively. Suggestions are made for process improvements and improving process economics.

2499 **(DOE/CS/40327—T2-Vol.1) Development of a low-temperature heat-pump grain dryer. Volume I: main body.** Hogan, M.R.; Ayers, D.L.; Schweizer, P.F.; Doering, O.C.; Foster, G.H. (Westinghouse Electric Corp., West Lafayette, IN (USA). Fluid Systems Lab.). Nov 1979. Contract AC07-77CS40327. 244p. NTIS, PC A11/MF A01. Order Number DE82018807.

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The development of a prototype low-temperature heat pump grain dryer is documented. Previous developmental work, embodied in a heat pump design code and a first generation heat pump dryer, is reviewed in the context of this research. The developed heat pump design philosophy is reported, and each pertinent step in the design process detailed, particularly the computer-generated sealed refrigerant system synthesis. A new, innovative technique for controlling evaporator frost, while maintaining continuous and efficient drying, is revealed. Also presented is a control system which surmounts the difficulties in heat pump operation imposed by an initially cold grain mass in the dryer volume. Fabrication of the developed heat pump dryer is also documented. Also included are details of a comparative field test of the prototype heat pump dryer and a commercial 24 kW electric resistance dryer. Field test instrumentation, preparation, and supervision are reported. Performance data, acquired during the field test, are presented and comparisons between the heat pump and resistance system are performed. Results of an economic analysis of heat pump grain drying as compared to current and contemplated drying alternatives are presented. Conclusions concerning the future viability of heat pump grain drying are drawn and discussed.

2500 **(DOE/CS/40327—T2-Vol.2) Development of a low-temperature heat-pump grain dryer. Volume II: appendices.** Hogan, M.R.; Ayers, D.L.; Schweizer, P.F.; Doering, O.C.; Foster, G.H. (Westinghouse Electric Corp., West Lafayette, IN (USA). Fluid Systems Lab.). Nov 1979. Contract AC07-77CS40327. 269p. NTIS, PC A12/MF A01. Order Number DE82019844.

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Supporting information is given for the design, testing, and economic analysis of the heat pump grain dryer. The appendices include: heat pump design code sample input and output listing; performance and mechanical characteristics of the centrifugal fan selected for the heat pump grain dryer; characteristics of the line of refrigerant compressors made available to the heat pump design

code for selection; variable input data employed in the development of the low-temperature heat pump grain dryer and a compilation of the generated designs; heat pump and electric resistance dryer data reduction code listing; energy and material price forecasts for the heat pump grain dryer economic study; specifications and performance information on the drying systems studied in the economic analysis; estimated costs of a line of low-temperature heat pump dryer units; equipment specification and cost for the system studied in the economic analysis; and a listing of the reduced heat pump-electric resistance field test data. (LEW)

2501 **(DOE/CS/90024—1) Preliminary analysis of the state of the art of robotics and precision engineering and evaluation of potential for improved energy utilization in the pulp, paper, and related energy-consuming processes. Final report.** (Thermo Electron Corp., Waltham, MA (USA)). Jan 1982. Contract AC02-81CS90024. 64p. NTIS, PC A04/MF A01. Order Number DE83001016.

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This study was undertaken to conduct a preliminary analysis of the state of the art of two technologies, robotics and precision engineering, and to evaluate their potential for improved energy utilization in the pulp, paper, and related energy consuming processes. Activity in the robotics field is growing rapidly, most activity being related to the development of smart robots rather than to systems. There is a broad base of support, both in industry and the universities, for upgrading robot machine capabilities. A large part of that support is associated with visualization and tactile sensors which facilitate assembly, placement, inspection, and tracking. Progress in this area is relatively rapid and development times are short for specifically engineered applications. The critical path in the development of robotic systems lies in the generation of reliable sensor signals. Robotic systems require a broad spectrum of sensors from which hierarchical logic systems can draw decision making information. This requirement resulted in the establishment of a program at the National Bureau of Standards which is attempting to develop a spectrum of sensor capabilities. Such sensors are applicable to robotic system automatic process control in a variety of energy-intensive industries. Precision engineering is defined as the generation or manufacture of components wherein geometry, dimension, and surface finish are controlled to within several hundred Angstroms in single point turning operations. Investigation into the state of the art of precision engineering in the United States finds that this capability exists in several national laboratories and is intended to be used exclusively for the development of weapons. There is an attempt at the present time by Lawrence Livermore Laboratory to expand its capability into industry. Several corporations are now beginning to develop equipment to support the precision engineering field.

2502 **(DOE/ID/12138—2) Assessment of gas-side fouling in cement plants.** Marner, W.J. (Jet Propulsion Lab., Pasadena, CA (USA)). Sep 1982. Contract AI07-80ID12138. 100p. (JPL-PUBL—82-83). NTIS, PC A05/MF A01. Order Number DE83001426.

The purpose of this study is to provide an assessment of gas-side fouling in cement plants with special emphasis on heat recovery applications. Exhaust gases in the cement industry which are suitable for heat recovery range in temperature from about 400 to 1300 K, are generally dusty, may be highly abrasive, and are often heavily laden with alkalies, sulfates, and chlorides. Particulates in the exhaust streams range in size from molecular to about 100 μm in diameter and come from both the raw feed as well as the ash in the coal which is the primary fuel used in the cement industry. The major types of heat-transfer equipment used in the cement industry include preheaters, gas-to-air heat exchangers, waste heat boilers, and clinker coolers. The most important gas-side fouling mechanisms in the cement industry are those due to particulate, chemical reaction, and corrosion fouling. Particulate transport mechanisms which appear to be of greatest importance include laminar and turbulent mass transfer, thermophoresis, electrophoresis, and inertial impaction. Chemical reaction mechanisms of particular importance include the deposition of alkali sulfates, alkali chlorides, spurrite, calcium carbonate, and calcium sulfate. At sufficiently low temperatures, sulfuric acid and water can condense on heat exchanger surfaces which can cause corrosion and also attract particulates in the flow. The deleterious effects of gas-side fouling in cement plants are due to: (1) increased capital costs; (2) increased maintenance costs; (3) loss of production; and (4) energy losses. A conservative order-of-magnitude analysis shows that the cost of gas-side fouling in US cement plants is $0.24 billion annually.

2503 (NRAES—13, pp 48-59) **Operations of farm scale manure fed anaerobic digestion systems.** Abeles, T.P.; Ellsworth, D.A. (I/E Associates, Inc., Minneapolis, MN). 1981. Northeast Regional Agricultural Engineering Service, Ithaca, NY 14853.

From Methane technology for agriculture conference; Ithaca, NY, USA (17 Mar 1981).

The methods and procedures for operating a methane digester are primarily determined by the philosophy of design which went into the system prior to construction on a particular farm site. Factors to be considered are: whether the value of the manure as fertilizer exceeds the value of the energy produced and the effluent fertilizer; whether diversifying the farm is a necessary step to utilizing the waste heat or biogas effectively; and whether an alternative bioconversion technique (combustion, aquaculture operations, or alcohol plants) would be more cost effective. Data are presented which aid in an analysis of these factors.

2504 (NRAES—13, pp 60-63) **Manure handling and application considerations following anaerobic digestion.** Klausner, S.D. (Cornell Univ., Ithaca, NY). 1981. Northeast Regional Agricultural Engineering Service, Ithaca, NY 14853.

From Methane technology for agriculture conference; Ithaca, NY, USA (17 Mar 1981).

Because 50 to 60% of the nitrogen in manures is incorporated into ammonia which is easily lost by volatilization, handling procedures become an important consideration to conserving the nitrogen content of manures. Crop yields show the advantages of side-dressed liquid manure incorporation over topdressing and of spring incorporation over fall use. Manure that has undergone anaerobic digestion requires the same nitrogen conservation practices.

2505 **(ORNL/TM—8385) Evaluation of tubular ceramic heat-exchanger materials in basic coal ash from coal-oil-mixture combustion.** Ferber, M.K.; Tennery, V.J. (Oak Ridge National Lab., TN (USA)). Oct 1982. Contract W-7405-ENG-26. 92p. NTIS, PC A05/MF A01. Order Number DE83001700.

Tubes of ten different structural ceramic materials were exposed to the hot combustion gases from a coal-oil-mixture (COM) fuel in the Ceramic Recuperator Analysis Facility (CRAF) at an outer tube wall temperature of about 1240°C for about 240 h. Air flow through each tube simulated the conditions in a tubular heat exchanger element. As-received and exposed materials and solidified coal slag were examined. Several important properties of the ceramics, including room-temperature helium permeability, room-temperature C-ring fracture strength, and thermal expansion from room temperature to 1100°C were measured for both as-received and exposed specimens. The ten structural ceramics included six types of silicon carbide, a high-purity alumina, and three types of newly available sialons. Highly fluid basic coal slag deposited on the outer surfaces of the structural ceramic tubes during the coal combustion and all of the tubes lost significant fractions of their wall thickness. Exposure to the hot coal slag increased permeability of all the surviving tubes by about one order of magnitude. The room-temperature C-ring fracture strength for the five types of SiC and one type of Al_2O_3 ceramic decreased by about 3 to 60%. Siliconized types of SiC had strength reductions of 38 to 61%. Sintered α-SiC showed the smallest strength reduction of 3%. The high purity Al_2O_3 had a strength loss of about 28%. The thermal expansion of these materials did not change significantly. 46 figures, 12 tables.

2506 **(P—500-81-038) Cogeneration feasibility study summaries.** (California Energy Resources Conservation and Development Commission, Sacramento (USA)). Dec 1981. 35p. California Energy Commission, 1111 Howe Avenue, Sacramento, CA 95825.

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Feasibility studies are briefly summarized for 30 California cogeneration projects. These are tabulated, giving funding level, project status, capacity, total project cost, and oil savings, and each is summarized individually, giving the project sponsor, energy and engineering, project description, summary of the results, and project status. The technologies analyzed in these studies range from gas turbines/waste heat recovery boilers to steam turbines to reciprocating internal combustion engines. (LEW)

2507 **(PB—82-193285) Feasibility study: utilization of waste heat from the William J. Neal station for commercial greenhouses. Final report.** (Basin Electric Power Cooperative, Bismarck, ND (USA)). Mar 1982. 135p. NTIS, PC A07/MF A01.

The objective of this study was to determine if a commercial scale greenhouse facility, using power plant waste heat as the primary heat source, was technically and economically feasible. To do so, a scope of work was initiated with two separate studies geared to determining the overall project feasibility. The results of the technical study indicate that the power plant in question, the William J. Neal Station (Neal Station) near Velva, N.D. could supply up to 97.2 percent of the required greenhouse heat on a long-term average basis if the power plant continues to operate in the future as it did in 1980. If the plant operates at a reduced output in the future, the waste heat source may still be acceptable because of the operating characteristics of the station.

2508 **(PB—82-200650) Advanced regenerative heat recovery system. Annual report Jan-Dec 81.** Prasad, A.; Jasti, J.K. (Midland-Ross Corp., Toledo, OH (USA). Technical Center - Thermal Systems). 18 Feb 1982. 79p. NTIS, PC A05/MF A01.

An advanced regenerative heat recovery system has been designed and fabricated to deliver 1500 scfm preheated air to a maximum temperature of 1600F. Since this system is operating at 2000F, the internal parts have been designed to be fabricated with ceramic materials. This system is also designed to be adaptable to an internal metallic structure to operate in the range of 1100 - 1500F. A test facility has been designed and fabricated to test this system. The test facility is equipped to impose a pressure differential of up to 27 inches of water column in between preheated air and flue gas lines for checking possible leakage through the seals. The preliminary tests conducted on the advanced regenerative heat recovery system indicate the thermal effectiveness in the range of 60% - 70%. Bench scale studies have been conducted on various ceramic and gasket materials to identify the proper material to be used in high temperature applications. A market survey has been conducted to identify the application areas for this heat recovery system. A cost/benefit analysis was made to establish the economic feasibility of this system. The analysis shows that this system would have a payback period of less than one and a half years.

2509 **(PB—82-212754) Sea pavement using sulfur obtained from coal gasification. Research report for dec 80-jul 81.** Kasinskas, M.M.; LaChance, H.C.; Nashold, F.G. (Connecticut Dept. of Transportation, Wethersfield (USA). Bureau of Highways). Oct 1981. 34p. NTIS, PC A03/MF A01.

A sulfur-extended asphalt (SEA) pavement using sulfur obtained from a coal gasification process was placed in a commuter parking lot. This report covers the design, mixing and placement of the SEA material and associated problems.

2510 **(PNL—4416-Vol.1) Industrial bottoming-cycle targeting of opportunities at the plant site. Volume I. Executive summary.** Moore, N.L.; Brown, H.L.; Hamel, B.B.; Toy, M.P.; Hedman, B.A. (General Energy Associates, Philadelphia, PA (USA)). Sep 1982. Contract AC06-76RL01830. 50p. NTIS, PC A03/MF A01. Order Number DE83001438.

Bottoming cycle potential in the US industrial marketplace is identified using the General Energy Associates Industrial Plant Energy Profile Data Base. From the data base technology evaluations and economic estimates can be made directly at the plant site level. The top 10,000 plants in the country were individually analyzed for these bottoming cycle applications. Results are summarized as follows: potential number of plant sites and megawatts, potential energy savings, electric production, regional and state profiles, bottoming cycle/working fluid systems, and projection of future bottoming cycle applications.

2511 **(PB—82-195835) Economy and energy recovery in the textile industry (economie et recuperation d'energie dans l'industrie textile). Final report.** Laneres, J.; Perrin, J. (Commission of the European Communities, Luxembourg). [nd]. 118p. NTIS, PC A05/MF A0.

An in-depth inquiry was made into the energy consumption of the finishing section of the French textile industry. It was divided into ten groups according to work methods and equipment used. 159 Firms were examined, representing 70% of French production. The following was considered: (1) energy consumption in the various groups; (2) equipment in use in the finishing section; (3) economy and energy recovery in heating process water; (4) economy and energy recovery in the drying process; recovery of hot air from drying; (5) calculation of specific energy consumptions. A large number of ways of savings, recovering or recycling energy were tested and their effectiveness demonstrated. Certain conclusions can be drawn from the work undertaken concerning capital expenditure, its importance, and the return to be expected.

2512 **(PB—82-198854) Energy use in the food manufacturing industry. Final report.** Whitman, W.E.; Crawford, A.G.; Elsen, C.R. (Commission of the European Communities, Luxembourg). [nd]. 193p. NTIS PC E08/MF E08.

A survey conducted by questionnaire in 1977/78 showed that the total energy used in the UK for the manufacture of food was about 67 PJ per annum and cost 95 million in 1976. The sector of the food industry using the highest amount of energy (24 PJ) concerned milling operations other than wheat milling. A major recommendation is that more effort should be devoted to demonstrating the value of energy audits to identify areas of waste. Demonstration projects are needed to prove the economic feasibility of systems for heat recovery. There is a need for a heat pump to use low grade heat to produce hot water at 100C or low pressure steam. Forms of motive power other than electricity should be considered, especially for energy intensive process machinery. Detailed studies are required of the energy used to provide refrigeration and of the energy used by transport to distribute raw materials and finished goods within the United Kingdom.

2513 **(PB—82-212838) The falling cloud heat exchanger commercial pilot plant operation. Final report.** Sagoo, M.S. (Commission of the European Communities, Luxembourg). [nd]. 36p. NTIS PC E04/MF E04.

The falling cloud heat-exchanger offers the prospects of recovering heat from hot, contaminated effluent gases in industry. Heat is transferred from the up-flowing hot exhaust gases to solid particles falling down a vertical duct or flue. The hot particles fall into a shallow fluidized bed heat-exchanger where the heat is recovered by water, steam or hot air. The cooled particles are then conveyed to the top of the flue to continue the cycle. Tests on the falling cloud commercial pilot plant have demonstrated that a high proportion of heat from hot exhaust gases flowing up a chimney can be recovered. Overall thermal efficiencies of up to 55% were obtained from heat recovery tests on the pilot plant. Thermal efficiencies greater than this can be achieved by improvements in the particle flow, fluidization and increasing the cooling water flow rate and plant optimization. The heat recovery rate from the plant was up to 27% greater than that obtained from the experimental rig operating under similar conditions.

2514 **(EUR—7189-EN) Formulation of a stochastic model for the evaluation of the specific consumption of electric energy of a mechanical plant.** Micheletti, C.F.; De Filippi, A.; Ippolito, R. (Commission of the European Communities, Luxembourg). [nd]. 297p. NTIS PC E11/MF E11.

The main features of the project concern: (1) the formulation of a stochastic model capable of simulating the absorption of electricity by a mechanical engineering factory using machine tools and (2) a factfinding survey to collect data about the energy requirements, performed on a large number of small to medium-sized factories. The model is applied to the checking of management poli-

cies and to the performance of forecast studies. Simulation of the production plant enables an estimate to be made of the soundness of steps taken to save energy. Surveys can be made to select the best area for siting a new factory in the light of the local availability of electricity. The model also enables an evaluation to be made in probalistic terms about the energy consumption levels during the course of the day, so that the size of the mains supply (both inside and outside the factory) can be determined with greater precision, and the contract between the manufacturer and the electricity supply company can be framed in a more perceptive manner.

3206 Municipalities And Community Systems

REFER ALSO TO CITATION(S) 1897, 2761

2515 **(AD-A—113947/6) Conversion of Army heating plants to coal: three case studies. Final report.** Singer, R.; Collishaw, A. (Army Construction Engineering Research Lab., Champaign, IL (USA)). Mar 1982. 208p. NTIS, PC A10/MF A01.

This study reports the results of three site-specific engineering studies to convert main heating plants to coal as a fuel. The Army installations examined were Redstone Arsenal, AL; Picatinny Arsenal, NJ; and the U.S. Military Academy (West Point) in New York. Each of these installations formerly fired coal and was converted to fuel oil about two decades ago. Researchers considered application of both current and advanced coal systems, which included direct combustion (either in suspension or on a grate), production and firing of low- and high-Btu coal-derived gas, and production and use of coal-derived liquid fuel. Both rehabilitation and replacement of plants were considered. Capital investment and annual operating costs are reported for alternative conversions. The report concludes that all three installations should change from fuel oil to coal based on the economics presented. The report recommends: that Redstone Arsenal rehabilitate and reconvert its boilers to fire coal; that Picatinny Arsenal build a new fluid bed boiler plant to replace the existing oil-fired plant; and that West Point build at a new location a coal-fired plant to replace the existing plant.

2516 **(BMFT-FB-T—82-025) Investigation of the economy of utilisation of methane gas in sewage treatment plants.** Wolf, P. (Bundesministerium fuer Forschung und Technologie, Bonn (Germany, F.R.)). 1982. 154p. (In German). NTIS (US Sales Only), PC A08/MF A01. Order Number DE82750551.

The economy of utilization of methane gas is disputed in cases of small and medium-sized treatment plants. Rising energy costs have given new perspective to this problem. Therefore the Bayerisches Landesamt fuer Wasserwirtschaft has aimed at clearing the question of economy. Existing and theoretical model plants of various sizes have been investigated by considering different scales of prices for electric power and fuel oil. This was done with variation of the kind of biological sewage treatment, sludge treatment and kinds and facilities of utilization of methane gas. The investigations on existing and theoretical model plants have shown, that using methane gas for power generation may become relatively economic in comparison to alternative methods of gas utilization for treatment plants bigger than 50 000 population equivalents. But practice shows that a lot of existing plants work uneconomically because of a too small load of the installed engines. Energy saving is not a sufficient condition for economy.

2517 **(CONF-820877—1) Energy conservation and methane production in municipal wastewater treatment using fixed-film, anaerobic bioreactors.** Genung, R.K.; Hancher, C.W.; Rivera, A.L. (Oak Ridge National Lab., TN (USA)). 1982. Contract W-7405-ENG-26. 2p. NTIS, PC A02/MF A01. Order Number DE82022318.

From American Institute of Chemical Engineers summer meeting; Cleveland, OH, USA (29 Aug 1982).

The primary objective of this project is the characterization and advanced development of an energy-conserving wastewater treatment system based on an anaerobic upflow (ANFLOW) bioreactor containing fixed films of microorganisms. This objective is being pursued through the operation of a 190-m^3/d (50,000-gpd) research and development (R & D) pilot plant at Knoxville, Tennessee. The criterion for success in this program is the development of a wastewater treatment system which has significant energy conservation and/or energy production advantages (e.g., through by-product methane formation) as well as lower capital costs when compared to conventional wastewater treatment systems.

2518 **(DOE/CS/50296—1) Alternative-fuel production facility for City of Huntsville, Alabama. Volume I. Executive summary.** (Huntsville, City of, AL (USA); Wegman (Leonard S.) Co., Inc., Buffalo, NY (USA)). Oct 1982. Contract FG01-80RA50296. 62p. NTIS, PC A04/MF A01. Order Number DE83001575.

Portions of document are illegible.

The feasibility of a Municipal Solid Waste (MSW)-to-energy project in the Huntsville area was invetigated and found to be an environmentally attractive and cost effective method of MSW disposal. Of nine likely alternatives, that were developed for detailed evaluation and analysis. Alternative 1M surfaced as best for the City. It is described as follows: a MSW-To-Energy Plant, consisting of two 300 TPD Mass Burning Waterwall Furnace/Boiler Systems at Lowe Industrial Park to provide low pressure steam to industries in the park. A MSW Transfer Station at the existing landfill and MSW as well as residue transport rolling stock equipment is included to facilitate movement of the waste materials between the two locations that are some twelve miles apart.

2519 **(DOE/CS/50296—5) Alternative-fuel production facility for city of Huntsville, Alabama. Volume V. Environmental assessment and permit workbook.** (Huntsville, City of, AL (USA); Wegman (Leonard S.) Co., Inc., Buffalo, NY (USA)). Oct 1982. Contract FG01-80RA50296. 111p. NTIS, PC A06/MF A01. Order Number DE83001744.

Portions of document are illegible.

A municipal solid waste (MSW) mass-burning facility proposed by the city of Huntsville, Alabama is addressed. Existing environmental settings and man-made features, sensitive and hazardous areas, and environmental and social impacts of the proposed facilities are presented. Also included is a permit workbook which summarizes the type of regulations that must be met, the types of permits required, and how to go about securing these various permits.

2520 **(INIS-mf—7183) Badenwerk AG Study: Feasibility of heat utilization from the Philippsburg nuclear power plant.** (Kraftanlagen-Planungs G.m.b.H., Heidelberg (Germany, F.R.)). Mar 1981. 144p. (In German). NTIS (US Sales Only), PC A07/MF A01. Order Number DE83780017.

The decoupling of useful heat is technically and economically feasible and sensible. The potential of district heat in Philippsburg supplied by the PWR comprises at first a connected load of about 17 MW in existing public buildings, dwelling blocks and factories that are new supplied with natural gas; additional new buildings substance of about 20 MW can be opened up in the medium and long run. The installation of the district heating system requires total investment costs of about 21 Mio DM. During the first 7-8 years considerable initial costs are to be expected that necessitate state-subsidizing. In the gardening industry the utilization of waste heat from the intermediate cooling loop and the short distance will, compared with the conventionally heated greenhouses, lead to economy of operation after the first year already. The pond industry has free heat at its disposal during the whole year except for the very cold winter months. (orig./HP).

2521 **(MTR—81W00127) Risk reduction and risk allocation in procuring resource-recovery systems: the success of HPOWER in Honolulu, Hawaii.** Zier, R.E.; Connelly, J. (Mitre Corp., Bedford, MA (USA)). Jun 1981. Contract FG01-79CS20244. 140p. NTIS, PC A07/MF A01. Order Number DE83001429.

The report is designed to acquaint municipal officials with a particularly unusual approach to resource recovery system procurement. The HPOWER project in Honolulu used a two-step approach based on US armed services procurement method for highly complex technology for which detailed specifications cannot be

provided early in the procurement. The two-step process provides for selection of eligible bidders on the basis of financial and technical qualifications. Eligible bidders are invited to file pricing proposals, and the preferred or lowest bid is selected from them. The background on municipal solid waste in Honolulu, genesis of and reasons for choosing 2-step method and structural implementation are provided.

2522 **(NP—2904426) Rational energy utilization within the framework of town renovation.** Volwahsen, A.; Roth, U.; Bruehl, W.; Haeubi, F.; Heide, R.; Hemmers, R.; Langraf, B.; Michel, B.; Pape, G.; Stolarz, H. (Bundesministerium fuer Raumordnung, Bauwesen und Staedtebau, Bonn (Germany, F.R.)). 1980. 53p. (In German). NTIS (US Sales Only), PC A04/MG A01. Order Number DE82904426.

Portions of document are illegible.

Energy consumption and housing structure are in close correlation. A series of research projects of the Federal Minister of Area Planning, Architecture and Town Construction aided to differentiate and concretize this general knowledge. The research project 'Rational Energy Utilization within the Framework of Town Renovation' is intended to clarify in this connection: in what way and to what extent measures of town renovation (modernization and reconstruction) can support the necessary reduction of heat required in rooms; to what extent new supply technologies can support or if necessary be adapted to economic, social and town planning aims. What legal instruments are suited to promote a coordinated planning of town renovation and energy supply - especially heat supply. The aim of these analyses is to provide the local authorities with decision aids by means of which they can better judge the pros and cons of a planned supply system knowing the local process of renovation. Furthermore it is intended to facilitate the increasingly necessary cooperation in expansion plans of utility companies for the municipal and local administrations.

2523 **(NP—2904427) Rational use of energy within the framework of new housing projects.** Breustedt, W.; Doeldissen, A.; Purper, G.; Falk-Stiller, A.; Bley, H.; Hein K. (Battelle-Institut e.V., Frankfurt am Main (Germany, F.R.); Heidenheimer Waermevertriebs G.m.b.H., Heidenheim (Germany, F.R.)). Apr 1981. 30p. (In German). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82904427.

The task of the research project was to find planning aids for a rational use of energy for the future planning of new housing developments. The basis of this project was the analysis and documentation of 16 typical housing developments in the Federal Republic of Germany. In detail the following questions were answered: Have so far attempts at a rational use of energy been considered at all within the framework of planning housing developments. What connections between individual proposals of measures for a rational use of energy must be considered within the framework of planning housing developments and where can signs of a further development of the guidelines for energy saving measures be seen. To what extent can the integration of energy supply planning and development planning be improved by changing the building and planning regulations and the course of planning. In what way must the planning aids for the development planning-practice in local authorities be designed.

2524 **(PB—82-189325) Predicting the impact of time-of-day electricity pricing in the state of Maryland. Final report.** Levin, S.L.; Taylor, L.D.; Wenders, J.T. (Data Resources, Inc., Washington, DC (USA)). Feb 1982. 58p. NTIS, PC A04/MF A01.

The study uses data for Maryland utilities, as well as the results of electricity pricing experiments in other states, to stimulate plausible scenarios of what could be expected as a result of the introduction of marginal-cost-based seasonal time-of-day (STD) rates for Maryland electricity customers. These scenarios are presented for customer classes and for individual utilities. The study suggests the results of STD pricing on kW demand as well as in KWh consumption. In addition, a benefit/cost analysis is presented to indicate which and how many of the utility's customers can profitably be placed on TD pricing.

2525 **(PB—82-198219) Energy management diagnostics. Technical report.** (Environmental Protection Agency, Washington, DC (USA). Office of Water Program Operations). Feb 1982. 41p. NTIS, PC A03/MF A01.

This manual will familiarize local officials and utility managers with the principles and practices of sound energy management, specifically applied to wastewater utility operations.

2526 **(PB—82-200544) Food, fuel, and fertilizer from organic wastes. Final report.** (National Research Council, Washington, DC (USA). Board on Science and Technology for International Development). 1981. 165p. NTIS, PC A08/MF A01.

This report examines some of the opportunities for the utilization of organic wastes and residues commonly found in the poorer rural areas of the world. It is based on discussions and presentations at a panel meeting of the Advisory Committee on Technology Innovation held on 6-8 August, 1979, in Airlie, Virginia, USA. The purpose is to set forth in array of alternatives for possible application where existing waste usage (or nonusage) is no longer appropriate. The processes described range from simple and inexpensive techniques to those more complex and costly. Many are already in use in rural areas, but some are still being developed at universities and research institutes. Although there are some generalizations on economic factors, projections of operating and capital costs in vastly different environments are impossible. Most of the processes described are both labor intensive and site sensitive.

2527 **(SERI/STR—231-1709) Internally insulated pipe systems for long-distance transport of thermal energy. A final subcontract report.** Leung, S.K.; Tanton, T.F.; Hausz, W.; Reed, W.; Bolden, B. (Eureka Labs., Inc., Sacramento, CA (USA)). Sep 1982. Contract AC02-77CH00178. 240p. NTIS, PC A11/MF A01. Order Number DE83000505.

Presented are the results of a study to evaluate the preliminary feasibility of internally insulated pipe systems for the transport of thermal energy over distances of 5 to 50 km. The specific objectives were to screen technologically feasible concepts, to determine the incremental cost relative to conventional externally insulated pipe, and to recommend areas requiring further research and development to commercialize the long distance transport of thermal energy. Two conceptual designs for internally insulated pipe systems were found which are technically feasible, from a standpoint of pressure induced stresses and thermal losses. At steam temperature range of 600 to 1000°F and pressure range of 600 to 1800 psi, the internal insulation cases are shown to provide less expensive transport of energy than conventional, external insulation pipe. At hot water temperatures between 250 to 450°F for similar power levels, internal insulation is comparable to external cases at the conservatively priced cost of energy at source of $2.63/10^6 Btu. At higher source cost, internal insulation would be more favored compared to external. It was determined that the primary reasons for the economic benefit of internal insulation compared to externally insulated pipe are the reduced pipe line length and hence the reduced material cost and heat loss cost penalty at high fluid temperature.

2528 **Community energy options: getting started in Ann Arbor.** Brunner, R.D.; Sandenburgh, R. (eds.). Ann Arbor, MI; University of Michigan Press (1982). 292p. University of Michigan Press, Ann Arbor, MI $14.50.

In Ann Arbor, Michigan, private citizens, public officials, and energy analysts collaborated on developing a comprehensive energy plan. Proposals ranged from reactivating a hydroelectric dam built in 1913 to a futuristic solar energy demonstration project. The result was a plan of action that relies on small, local solutions to energy shortages. National and local policy processes that affect energy program options are reviewed. A federal program is proposed to encourage and support local energy initiatives, based on an analysis of local needs. Six program options are presented. (LEW)

3209 Education And Public Relations

2529 **(DOE/TIC/EGC—81) Energygrams: brief descriptions of energy technology.** Simpson, W.F. Jr. (ed.). (Department of Energy, Oak Ridge, TN (USA). Technical Information Center). Dec 1981. 87p. NTIS, PC A05/MF A01. Order Number DE82003277.

Energygrams: Brief Descriptions of Energy Technology, is a compilation of technical notes (called Energygrams) published by the Technical Information Center. The Center instituted the Energygram program to help fulfill a mission of the US Department of Energy (DOE) to transfer information and technology generated from DOE-sponsored research to identifiable audiences in industry, education, and federal, state, and local government. The Technical Information Center routinely screens all DOE R and D reports to identify appropriate information. It also coordinates with DOE and DOE laboratory and contractor program managers in identifying research and development projects for the transfer program and in reviewing the technical content of Energygrams before publication. Energygrams are usually one-page illustrated bulletins describing DOE technology or data and telling how to obtain the technical reports or other material on which they are based. Frequently a personal contact is given who can provide program information in addition to the data found in the reports. The compilation is organized by subject categories, and, within each category, Energygrams are presented alphabetically by Energygram title. See the Contents for an overview of the compilation and the Subject Index for more specific topics. The index will be cumulated with each issue by calendar year.

2530 **(DOE/TIC/EGC—82/1) Energygrams: brief descriptions of energy technology.** Simpson, W.F. Jr. (ed.). (Department of Energy, Oak Ridge, TN (USA). Technical Information Center). Win 1982. 91p. NTIS, PC A05/MF A01. Order Number DE82003278.

Energygrams: Brief Descriptions of Energy Technology, is a compilation of technical notes (called Energygrams) published by the Technical Information Center. The Center instituted the Energygram program to help fulfill a mission to the US Department of Energy (DOE) to transfer information and technology generated from DOE-sponsored research to identifiable audiences in industry, education, and federal, state, and local government. The Technical Information Center routinely screens all DOE R and D reports to identify appropriate information. It also coordinates with DOE and DOE laboratory and contractor program managers in identifying research and development projects for the transfer program and in reviewing the technical content of Energygrams before publication. Energygrams are usually one-page illustrated bulletins describing DOE technology or data and telling how to obtain the technical reports or other material on which they are based. Frequently a personal contact is given who can provide program information in addition to the data found in the reports. The compilation is organized by subject categories, and, within each category, Energygrams are presented alphabetically by Energygram title. See the Contents for an overview of the compilation and the Subject Index for more specific topics. The index will be cumulated with each issue by calendar year.

33 ADVANCED AUTOMOTIVE PROPULSION SYSTEMS

3301 Internal Combustion Engines

REFER ALSO TO CITATION(S) 2542, 2546, 2546

2531 **(EUR—7190-FR) Analysis of partial charge function of command ignition engines. Definition of optimal means for energy production. Final report.** Douaud, A.; Eyzat, P. (Institut Francais du Petrole (IFP), 92 - Rueil-Malmaison). 1981. 129p. (In French). European Community Information Service, 2100 M St., N.W., Washington, DC 20037.

A formulation is given for mathematical models which describe internal combustion, heat and mass transfer phenomena in monocylinder and multi-cylinder engines for the purpose of improving energy production efficiency. Also studied is the effect of lubricants and lubrication conditions and mechanical energy. Energy yield improvements was found to be related to reducing the richness of fuel blend, increasing the compression ratio, and reducing mechanical losses. 6 references, 12 figures, 9 tables.

2532 **(NP—2904745) Experimental studies on the influence of combustion space geometry on the propagation of the flame front in a piston engine.** Gwan-Nulla, M. (Technische Hochschule Darmstadt (Germany, F.R.). Fachbereich Maschinenbau). 1980. 124p. (In German). NTIS (US Sales Only), PC A06/MF A01. Order Number DE82904745.

Thesis.

The dissertation shows that the combustion process can be made more efficient with some changes in the geometry of the combustion engine. Measurements were carried out in a test engine under different experimental conditions and with various fuel mixtures. As a result a conception of a combustion space with varying compression was obtained. This way, combustion can be controlled so as to achieve maximum efficiency and profitability while minimizing pollution. A theoretical combustion model was developed in order to validate the findings.

2533 **(PB—82-194937) Environmental Protection Agency (EPA) evaluation of the Super-Mag Fuel Extender under Section 511 of the Motor Vehicle Information and Cost Savings Act. Technical report.** Ashby, H.A. (Environmental Protection Agency, Ann Arbor, MI (USA)). Jan 1982. 28p. NTIS, PC A03/MF A01.

This document announces the conclusions of the EPA evaluation of the 'Super-Mag Fuel Extender' device under provisions of Section 511 of the Motor Vehicle Information and Cost Savings Act. On December 10, 1980, the EPA received a written request from the Metropolitan Denver District Attorney's Office of Consumer Fraud and Economic Crime to test at least one 'cow magnet' type of fuel economy device. Following a survey of devices being marketed, the Metropolitan Denver District Attorney's Office selected the 'Super-Mag' device as typical of its category and on April 13, 1981 provided EPA with units for testing. The EPA evaluation of the device using three vehicles showed neither fuel economy nor exhaust emissions were affected by the installation of the 'Super-Mag' device. In addition, any differences between baseline test results and results from tests with the device installed were within the range of normal test variability.

2534 **(PB—82-199217) Potentials for energy conservation by a shift to other types of engines in passenger cars. Final report.** Rijkeboer, R.C.; Smit, W. (Commission of the European Communities, Luxembourg). [nd]. 165p. NTIS PC E07/MF E07.

The structure and performance of different types of engine in passenger cars were investigated with a view to determining whether alternative types of engine have a potential for saving energy. Diesel, petrol, liquefied petroleum gas, methanol, hydrogen, and various combinations of these are compared as sources of power for the various engine designs. A change to alternative fuels can only be achieved if they can be made available in sufficient quantities to meet demand. The ability of the fuel industry to keep pace with potential demand for the different types of fuel is discussed. The fuels are compared with regard to the production of carbon monoxide, nitrogen oxides, aldehydes, lead carcinogenic polynuclear aromatic hydrocarbons, and other toxic exhaust emissions. A number of scenarios are presented for the years 1980-1990 for a transfer to different types of engine. Long-term possibilities in engine design are considered.

3302 External Combustion Engines

REFER ALSO TO CITATION(S) 2495

2535 **(DOE/NASA/0032—17) Automotive Stirling engine Mod I design-review report. Volume II.** (Mechanical Technology, Inc., Latham, NY (USA)). Aug 1982. Contract AI01-77CS51040. 467p. (NASA-CR—167936; MTI—80ASE142DR1). NTIS, PC A20/MF A01. Order Number DE83001746.

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Volume No. 2 of the Automotive Stirling Engine Mod I Design Review Report contains descriptions of the operating principles, performance requirements and design details of the auxiliaries and control systems for the MOD I Stirling engine system. These components and sub-systems have the following main functions: provide the required fuel and air flows for a well controlled combustion process, generating heat to the Stirling cycle; provide a driver acceptable method for controlling the power output of the engine; provide adequate lubrication and cooling water circulation; generate the electric energy required for engine and vehicle operation; provide a driver acceptable method for starting, stopping and monitoring the engine; and provide a guard system, that protects the engine at component or system malfunction.

2536 **(DOE/NASA/0032—18) Automotive Stirling Engine Mod I design review report. Volume III.** (Mechanical Technology, Inc., Latham, NY (USA)). Aug 1982. Contract AI01-77CS51040. 360p. (NASA-CR—167937; MTI—80ASE142DR1). D. Order Number DE83001745.

Portions of document are illegible.

This volume, No. 3, of the Automotive Stirling Engine Mod 1 Design Review Report contains a preliminary parts list and detailed drawings of equipment for the basic Stirling engine and for the following systems: vehicular Stirling Engine System; external heat system; hot and cold engine systems; engine drive; controls and auxiliaries; and vehicle integration. (LCL)

3303 Electric-powered Systems

2537 **(DOE/NASA/51044—25) On-the-road performance tests of electric test vehicle for correlation with road load simulator.** Dustin, M.O.; Slavik, R.J. (National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center). Aug 1982. Contract AI01-77CS51044. 27p. (NASA-TM—82900). NTIS, PC A03/MF A01. Order Number DE83001577.

Portions of document are illegible.

A special purpose dynamometer (Road Load Simulator) is being used at NASA Lewis Research Center to test and evaluate electric vehicle propulsion systems developed under DOE's Electric and Hybrid Vehicle Program. To improve correlation between system tests on the Road Load Simulator and on the road, similar performance tests are being conducted using the same vehicle. The results of track tests on the Lewis electric propulsion system test vehicle are described in this report. The tests include range at constant speeds and over SAE J227a driving cycles, maximum accelerations, maximum gradability, and tire rolling resistance determination. Road power requirements and energy consumption were also determined from coast-down tests.

2538 **(DOE/NASA/51044—28) Summary of electric vehicle dc motor-controller tests.** McBrien, E.F.; Tryon, H.B. (National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center). Sep 1982. Contract AI01-77CS51044. 29p. (NASA-TM—82863). NTIS, PC A03/MF A01. Order Number DE83001124.

Portions of document are illegible.

Available performance data for production motors are usually of marginal value to the electric vehicle designer. To provide at least a partial remedy to this situation, tests of typical dc propulsion motors and controllers were conducted as part of the DOE Electric Vehicle Program. The objectives of this program were to evaluate the differences in the performance of dc motors when operating with chopper-type controllers and when operating on direct current; and to gain an understanding of the interactions between the motor and the controller which cause these differences. Toward this end, motor-controller tests performed by the NASA Lewis Research Center provided some of the first published data that quantified motor efficiency variations for both ripple-free (straight dc) and chopper modes of operation. Test and analysis work at the University of Pittsburgh explored motor-controller relationships in greater depth. And to provide additional data, 3E Vehicles tested two small motors, both on a dynamometer and in a vehicle, and the Eaton Corporation tested larger motors, using sophisticated instrumentation and digital processing techniques. All the motors tested were direct-current types. Of the separately excited types, seven were series wound and two were shunt wound. One self-excited permanent magnet type was also tested. Four of the series wound motors used brush shifting to obtain good commutation. In almost all cases, controller limitations constrained the test envelope so that the full capability of the motors could not be explored.

2539 **(TVA/PUB—83/6) Test and evaluation report for the Grumman-Olson Kurbwatt.** Barnett, J.H.; Carter, C.L.; Metcalfe, J.K.; Whitehead, G.D. Driggans, R.L.; Todd, D.E. (Tennessee Valley Authority, Chattanooga (USA)). 1982. 93p. NTIS, PC A05/MF A01. Order Number DE83900052.

This report documents the results obtained from tests performed on the Kurbwatt, an electric vehicle (EV) designed and constructed by Grumman Olson (a divison of Grumman Allied Industries, Inc.), between August 1981 and April 1982 at the Tennessee Valley Authority (TVA) Electric Vehicle Test Facility (EVTF) in Chattanooga, Tennessee. Data on vehicle physical characteristics and performance acquired during tests conducted under test track, dynamometer, and on-road conditions are presented along with descriptions of the vehicle and its components and information on the reliability of the vehicle during the test period. This testing was performed by TVA and was sponsored by the Electric Power Research Institute (EPRI).

2540 **(PB—82-195843) Galvanic high energy cells with molten electrolytes.** Borger, W.; Kappus, W.; Kunze, D.; Laig-Hoerstebrock, H.; Panesar, H. (Commission of the European Communities, Luxembourg). [nd]. 248p. NTIS, PC A09/MF A01.

High energy galvanic cells as energy stores offer the potential of about 40% better utilization of primary energy for vehicular and also stationary power production, especially where peak loads are concerned. The objective was to produce fused salt cells of high specific energy and high specific power (150 Ah for 5 hour rate) and 80 Wh/kg. 29 Electrochemical couples were tested for a range of factors and LiAl/FeS using specially prepared FeS appeared most suitable for development of a 200 Ah prototype cell. Detailed studies were made of separators, positive current collectors, swelling phenomena and discharge kinetics of model electrodes. Post-test examination studied causes of cell failure, and a preliminary cost-benefit analysis was made.

3307 Emission Control

REFER ALSO TO CITATION(S) 2484, 2485, 2486, 2487, 2488, 2975

2541 **(PB—82-183880) NO/sub x/ emission controls for heavy-duty vehicles: toward meeting a 1986 standard. Final report.** (National Academy of Sciences - National Research Council, Washington, DC (USA)). 1981. 130p. NTIS, PC A07/MF A01.

In late 1980 the U.S. Environmental Protection Agency (EPA), as part of its rulemaking in establishing emission standards for heavy-duty vehicles called for in the Clean Air Act, as amended in 1977 (42 USC 7401 et seq.), requested that the National Research Council study the technological feasibility of meeting a more stringent standard for nitrogen oxides (NOx) emissions by 1986. The Assembly of Engineering established the Motor Vehicle Nitrogen Oxides Standard Committee to carry out the requested study. Heavy-duty vehicles are extremely varied in size, operating conditions, and vehicle type; the category includes trucks, buses, large vans, and recreational vehicles. This report focuses on the impact of emission control technologies on the cost, efficiency, and performance of heavy-duty engine vehicles and their impact on other potentially hazardous engine emissions. The committee sought to provide an independent analysis of the scientific, technical, and cost

issues raised by NOx emission controls for heavy-duty vehicles of model year 1986. The committee noted several policy questions that arose from the technical findings in this study; these questions should be considered in a rulemaking procedure, but in the committee's judgment their answers require policy decisions beyond the scope of the committee's charge.

3308 Alternative Fuels

REFER ALSO TO CITATION(S) 2481

2542 **(AD-A—112010/4) Impact of gasohol on the I-141 and LDT-465-1C engines. Interim report, October 1980-September 1981.** Likos, W.E.; Yost, D.M. (Southwest Research Inst., San Antonio, TX (USA). Army Fuels and Lubricants Research Lab.). Dec 1981. 110p. (AFLRL—148). NTIS, PC A06/MF A01.

Gasohol was analyzed in the L-141 and LDT-465-1C engines in order to determine its impact upon engine operability. During various steady-state operating conditions, with the L-141 engine, gasohol was found to improve economy under heavily loaded conditions, while a deterioration will occur during light and intermediate loading. An evaluation of emission and nonemission-regulated carburetors shows the nonemissions carburetor better suited for gasohol use. No effects on maximum power produced were noted with gasohol. Simulated driveability tests with the L-141 engine on a dynamometer showed differences in engine response between the different fuels, but actual vehicle tests proved that driveability was not altered. A relatively short endurance test with the L-141 engine on gasohol fuel indicates, based on engine oil analysis, no significant change in engine wear rates. The endurance test did indicate, however, that more frequent oil drain intervals may be required due to TBN depletion of the engine oil. Cold start testing of the LDT-465-1C engine indicates that gasohol is of inadequate cetane number to sustain normal engine operation. Thus, it is recommended that gasohol not be used in the LDT-465 family of engines.

2543 **(AD-A—113461/8) Development of accelerated fuel-engines qualification procedures methodology. Volume I. Interim report Oct 80-Sep 81.** Russell, J.A.; Cuellar, J.P. Jr; Tyler, J.C.; Erwin, J.; Alvarez, R.A. (Southwest Research Inst., San Antonio, TX (USA). Army Fuels and Lubricants Research Lab.). Dec 1981. 216p. NTIS, PC A10/MF A01.

Activities and findings are reported for a 12-month program aimed at the development of procedures for accelerating the qualification of new fuels on Army equipment, emphasizing those derived from oil shale and coal. Prinicpal activities were identification of key tactical and combat surface and air vehicles, powerplants, and fuels systems components; identification of critical properties peculiar to new fuels anticipated to have significant impact upon Army materiel; laboratory evaluations of materials compatibility and fuels characteristics (including lubricity, elastomer compatibility, thermal stability, and corrosion); full-scale fuel systems component testing, and an overall review and evaluation of existing engine/fuel system qualification procedures. Conclusions and recommendations are presented in terms of methodology and criteria which will realistically address key peculiarities of alternative fuels and thus serve to accelerate their qualification for field Army use.

2544 **(AD-A—113532/6) Development of accelerated fuel-engines qualification procedures methodology. Volume II. Appendices. Interim report for Oct 80-Sep 81.** Russell, J.A.; Cuellar, J.P. Jr; Tyler, J.C.; Erwin, J.; Knutson, W.K. (Southwest Research Inst., San Antonio, TX (USA). Army Fuels and Lubricants Research Lab.). Dec 1981. 438p. NTIS, PC A19/MF A01.

This volume of appendices includes: AVRADCOM Aircraft/Engine Component Listings; AFLRL Elastomer Swell and Hardness Data; AFLRL Elastomer Retention Properties; JFC 78 500-Hour Shale Oil Fuel Plan of Test, April 20, 1981; JFC 78 Shale Oil Fuel Plan of Test, Revised July 30, 1981; Pre and Post Test Definition Data; Spot Calibration; Flow Test; Fuel Characteristics and Lubricity and Interfacial Tension; Detailed Component Test Results; Disassembly and Inspection Results; Identification of Critical Fuel System Components; Existing Engine Qualifications Procedures; NATO Standard Engine Laboratory Test-Edition June 80; Fuel System Components Qualification Procedures; and EPA Heavy-Duty Diesel Engine Exhaust Emissions Certification and Test Procedures.

2545 **(DOE/ID/12329—T1) Demonstration of modification of a gasoline spark-ignited engine to permit using ethanol as a fuel.** Freeman, D.; Peters, J.F. (Alabama Univ., Huntsville (USA). Kenneth E. Johnson Environmental and Energy Center). Jan 1982. Contract FG07-81ID12329. 39p. NTIS, PC A03/MF A01. Order Number DE83001384.

Portions of document are illegible.

A project to modify a 1980 Dodge Custom D-150 truck to run exclusively on hydrated ethyl alcohol is described. The modification was first accomplished using 200 proof (anhydrous) denatured ethanol. With the compression ratio increased to 12:1, the truck ran well on proofs as low as 160. A modification manual for conversion of gasoline engines to permit use of alcohol as a fuel is appended.

2546 **(PB—82-184961) Sensitivities of internal combustion automotive engines to variations in fuel properties. Final report, April-December 1981.** Henein, N.A. (Wayne State Univ., Detroit, MI (USA)). Feb 1982. 236p. NTIS, PC A11/MF A01.

An assessment of the sensitivity of the automotive gasoline and diesel engines to variations in fuel properties has been made. The variables studied include H/C ratio, distillation range, aromatic content, ignition quality as determined by the octane number, and the auto-ignition quality as determined by the cetane number. The sensitivity of the engine is 'measured' against its power output, fuel economy, emissions, and degradation of lubricants. The sensitivity to the use of alternate fuels such as neat fuels or fuel extenders is discussed. The alternate fuels studied include shale oil derivatives, coal liquefaction derivatives, and alcohols. The impact of using emergency fuels in automotive gasoline and diesel engines is discussed.

36 MATERIALS

REFER ALSO TO CITATION(S) 1548

3601 Metals And Alloys

REFER ALSO TO CITATION(S) 1522, 1556, 1556, 1557, 1557, 1558, 1559, 1755, 1844, 1990, 2071, 2136, 2142, 2161, 2178, 2221, 2224, 2224, 2226, 2261, 2364, 2365, 2722, 2748, 2820, 2866, 2902, 3040, 3532, 3538, 3857

2547 **(AD-A—113425/3) Hydrogen induced intergranular cracking of nickel-base alloys. Final technical report.** Latanision, R.M. (Massachusetts Inst. of Tech., Cambridge (USA). Corrosion Lab.). Feb 1982. 21p. NTIS, PC A02/MF A01.

This final report is intended to summarize the activities pursued during the course of a program directed toward an evaluation of the susceptibility of nickel and nickel-base alloys to embrittlement by cathodically produced hydrogen. The transport of hydrogen by lattice and grain boundary diffusion, as well as by mobile dislocations, has been examined.

2548 **(AD-A—113782/7) Ion implantation studies of titanium metal surfaces. Final report.** Stevenson, J.R.; Legg, K.O.; Ribarsky, M.W. (Georgia Inst. of Tech., Atlanta (USA). School of Physics). 1981. 58p. NTIS, PC A04/MF A01.

The influence of implants on the surface characteristics and oxidation of titanium and the use of various techniques to probe the surface structure have been studied. The surface condition of the metal was shown to affect greatly the implant distribution. Erbium implants did not segregate at all to a clean titanium surface but segregated completely to a carbon covered surface. Initial monolayer oxide formation is unaffected by implanted calcium, which does not segregate to the surface. The electronic structure of the oxide layer is, however, unexpectedly complicated, showing features in the

electron energy loss spectrum very different from the clean surface. It is shown that care must be taken in studying the loss spectrum itself, especially in identifying the plasmon loss peaks and features associated with the clean surface. It has been found that different implants can seriously affect mechanical strain in the oxide, leading to rumpling and spalling in the case of Ti or Sb implants. These effects appear to be associated with implant segregation to the metal-oxide interface. A semiquantitative electron channeling method has been developed for determining damage levels in implanted materials.

2549 **(AERE-R—10447) Determination of the onset of ductile crack extension in 2 1/4 Cr 1 Mo steel by multi-specimen J integral testing.** Druce, S.G. (UKAEA Atomic Energy Research Establishment, Harwell. Metallurgy Div.). Feb 1982. 16p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702538.

Results obtained at AERE Harwell as part of the first phase of the European Group on Fracture round robin activity into ductile crack initiation detection are presented and discussed. Data are analysed using the current ASTM Jsub(IC) testing procedure and by an alternative procedure. Difficulties in the definition of 'initiation' are highlighted and deficiencies of the ASTM procedure exposed. The ASTM Jsub(IC) value for 2 1/4 Cr 1 Mo steel was determined as 0.21 MN/m. The alternative procedure provides a more accurate evaluation of the 'initiation' value of J, that is, at the point of crack advance in excess of that due to crack tip blunting. Using this procedure the 'initiation' value, Jsub(i), was measured as 0.14 MN/m.

2550 **(ANL-CEN-RSD—82-4) Tables of thermodynamic properties of sodium.** Fink, J.K. (Argonne National Lab., IL (USA)). Jun 1982. Contract W-31-109-ENG-38. 214p. NTIS, PC A10/MF A01. Order Number DE83000923.

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The thermodynamic properties of saturated sodium, superheated sodium, and subcooled sodium are tabulated as a function of temperature. The temperature ranges are 380 to 2508 K for saturated sodium, 500 to 2500 K for subcooled sodium, and 400 to 1600 K for superheated sodium. Tabulated thermodynamic properties are enthalpy, heat capacity, pressure, entropy, density, instantaneous thermal expansion coefficient, compressibility, and thermal pressure coefficient. Tables are given in SI units and cgs units.

2551 **(BMFT-FB-T—82-033) A15 phase superconductors with high current capacities.** Springer, E.; Rupp, G.; Wilhelm, M.; Wohlleben, K. (Bundesministerium fuer Forschung und Technologie, Bonn (Germany, F.R.)). Feb 1982. 63p. (In German). NTIS (US Sales Only), PC A04/MF A01. Order Number DE82750581.

The development of Nb_3Sn-filamentary conductors, produced by the solid diffusion process, was continued with the aim to get homogenous properties in long length. New conductor types with stabilizing copper in the cross-section were developped, which are suited for cabling to conductors with high current capacities. Some cables were made - all of them were fully transposed and highly compacted; length up to 2300 m and currents up to 2300 amps at 10 T and 4.2 K could be reached. The reaction conditions for Nb_3Sn conductors were investigated. In the case that hydrogen was in the annealing atmosphere there were a change in the field dependence of the current density sub(ov)(B)). The filamentdiameter also varied the ciritcal current density. An appratus was constructed and tested to spool reacted conductors. The conductors were tested on their homogeneous properties in solenoids which were made by the wind-and-react-technique. With a NbTi-coil (7 T) in a free bore of 40 mm 15 T at 4.2 K could be attained. All aims of the development could not be reached, because it is reported on works which were made in one year - instead of three years which were planned earlier.

2552 **(BNL—31863) L edge-absorption systematics of some transition-metal (Pd, Ag), main-group-metal (Sn, In), and ionic (CsI) systems.** Sham, T.K. (Brookhaven National Lab., Upton, NY (USA)). 1982. Contract AC02-76CH00016. 3p. (CONF-820957—2). NTIS (US Sales Only). Order Number DE83000243.

From International conference EXAFS and near edge structures; Frascati, Italy (13 Sep 1982).

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The L edge absorption of Pd, Ag, Sn, In, and CsI was measured in order to study the density of states and the unoccupied d states. 4 figures. (DLC)

2553 **(CALT—822-134) Partial pair-correlation functions of La/sub 1-x/(A1-Ga-Au)/sub x/ metallic glasses from x-ray-diffraction data.** Williams, A. (California Inst. of Tech., Pasadena (USA). W.M. Keck Lab. of Engineering Materials). May 1982. Contract AT03-81ER10870;AM03-76SF00767. 16p. NTIS, PC A02/MF A01. Order Number DE83000629.

X-ray-diffraction studies of La/sub 1-x/Al/sub x/, La/sub 1-x/($Al_{0.5}Ga_{0.5}$)/sub x/, La/sub 1-x/Ga/sub x/ and La/sub 1-x/Au/sub x/ metallic glasses have been performed for x = 0.20, 0.24, and 0.28. Similarities in the radial distribution functions for these materials as well as other data suggest that these alloys are isostructural. Experimental data from different alloys have therefore been used to separate the three different pair-distribution functions, which are then compared to dense random packing models and data for other metallic glasses.

2554 **(CONF-811037—4) Importance of stress state on hydrogen embrittlement.** Louthan, M.R. Jr.; McNitt, R.P.; Sisson, R.D. (Virginia Polytechnic Inst. and State Univ., Blacksburg (USA). Coll. of Engineering). 1982. Contract AS05-78ER06039. 18p. NTIS, PC A02/MF A01. Order Number DE83001158.

From TMS/AIME fall meeting on advanced techniques for the characterization of hydrogen in metals; Louisville, KY, USA (11 Oct 1981).

Portions of document are illegible.

The accurate assessment of the compatibility of metals and alloys with in-service hydrogen environments requires the ability to extrapolate short term laboratory test data to long term engineering applications. This extrapolation frequently requires the use of tensile and subsized fracture mechanics specimens to predict the behavior of large scale structural components. Both macroscopic and microscopic stress states in the test specimens may be quite different from those in the structural component; thus it is vital to understand the potential roles of stress state in the hydrogen embrittlement process. This paper demonstrates the importance of stress state in the assessment of hydrogen compatibility and shows that for safe, efficient materials utilization design data must be based on the results of several types of mechanical tests.

2555 **(CONF-811037—5) Precipitation reactions during the heat treatment of ferritic steels.** Vitek, J.M.; Klueh, R.L. (Oak Ridge National Lab., TN (USA)). 1981. Contract W-7405-ENG-26. 26p. NTIS, PC A03/MF A01. Order Number DE83001894.

From TMS/AIME fall meeting on advanced techniques for the characterization of hydrogen in metals; Louisville, KY, USA (11 Oct 1981).

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The precipitation reactions in two ferritic steels, 9 Cr-1 Mo-V-Nb and 12 Cr-1 Mo-V-W, were studied. Analytical electron microscopy, optical microscopy, chemical extractions, and hardness measurements were used to determine the types, amounts, and effects of precipitates formed as a function of the heat treatment. The effect of variations in the austenitizing treatment was ascertained. In addition to variations in the austenitizing time and temperature, different cooling rates after austenitization were also used. Air cooling after austenitization (normalization) resulted in little precipitation in both alloys. Precipitation in the 12 Cr-1 Mo-V-W alloy after furnace cooling was found in all cases examined. Under certain conditions precipitation was found after furnace cooling the 9 Cr-1 Mo-V-Nb alloy.

2556 **(DOE/ER/01023—5) Study of mechanisms of hydrogen diffusion in separation devices. Annual progress report, 1981-1982.** Lee, M.H. (Georgia Univ., Athens (USA). Dept. of Physics). 9 Apr 1982. Contract AS09-77ER01023. 11p. NTIS, PC A02/MF A01. Order Number DE83000294.

Our progress is described in detail in 11 scientific articles, listed under Publications in Sec. III. Our main results are in the following three areas: 1) high-temperature behavior of a hydrogen-metal system; 2) low-temperature behavior of a hydrogen-metal system; 3) transport theory. The progress made during this period has been particularly significant in showing the nature of mechanisms of diffusion. Our advances have made it possible to study some of our long-range objectives put forth in our initial proposal.

2557 **(DOE/ER/03612—15) Investigation of irradiation strengthening of body centered cubic metals and their alloys. Final report.** Arsenault, R.J. (Maryland Univ., College Park (USA)). 1978. Contract AS05-76ER03612. 17p. NTIS, PC A02/MF A01. Order Number DE83001653.

The purpose of the proposed research was to determine how neutron damage affects the low temperature deformation mechanism or mechanisms in body centered cubic metals. The aims of this research can be stated more specifically as follows: the determination of the barrier to dislocation motion introduced by neutron irradiation damage; determine the mechanism by which the dislocation overcomes this barrier; and determine the density of the neutron produced barriers which are overcome by thermally activated motion of the dislocation.

2558 **(DOE/ER/04311—T1) Quantitative analysis of solute segregation in alloys by transmission electron microscopy. Final report through October, 1980.** Hren, J.J.; Hartley, C.S. (Florida Univ., Gainesville (USA). Engineering and Industrial Experiment Station). Jun 1981. Contract AS05-76ER04311. 7p. NTIS, PC A02/MF A01. Order Number DE82021853.

A fundamental understanding of the contrast effects from small defects of all common types is derived. This includes small precipitates and superpositions of solute atoms and/or precipitates and dislocation-based defects (e.g., loops, lines, stacking faults). Both the infinitesimal and finite approximations can be employed routinely in the isotropic case as need be. The anisotropic elastic effects have not been studied since these are most fruitfully studied case by case. Studies to two beam diffraction contrast using the column approximation have been restricted but extensions to multi-beam conditions are straightforward. No fundamentally new contrast effects are expected either, by dropping the column approximation. A workable understanding of the contrast effects from small precipitates and solute/dislocation loop contrast has been reached. A good understanding of the useful limits to the diffraction contrast approach as it can be applied to solute segregation (or precipitation) has been derived.

2559 **(DOE/ER/06039—T1) Hydrogen-embrittlement testing. Status report.** Louthan, M.R. Jr. (Virginia Polytechnic Inst. and State Univ., Blacksburg (USA). Dept. of Materials Engineering). 10 Sep 1982. Contract AS05-78ER06039. 11p. NTIS, PC A02/MF A01. Order Number DE83001549.

The 1981-1982 experimental investigations of Hydrogen Embrittlement Testing at Virginia Polytechnic Institute have provided several significant insights into the difficulties of using electrochemical charging techniques to duplicate gas phase hydrogen exposures. However, in spite of these experimental difficulties, several important hydrogen induced effects were studied. These effects included the observation of hydrogen induced weakening of metal-non metal interfaces and of metal-metal boundaries such as twin boundaries, grain boundaries and slip bands. Impact and slow bend testing of hydrogen charged samples illustrated that this weakening is inherent with hydrogen absorption and that dislocation transport of hydrogen is not necessary for interfacial embrittlement to occur. These observations are in general agreement with the model (proposed last year) that hydrogen absorption decreases the stress necessary for interfacial fracture to occur. Experimental details supporting these observations are summarized in this report.

2560 **(DOE/ER/10382—3) Local atomic and electronic structure in glassy metallic alloys. Final report, March 1, 1979-May 31, 1982.** Messmer, R.P.; Wong, J. (General Electric Co., Schenectady, NY (USA). Corporate Research and Development Center). 1982. Contract AC02-79ER10382. 28p. (GE/SRD—82-044). NTIS, PC A03/MF A01. Order Number DE82018278.

Portions of document are illegible.

The research results reported, represent the first coordinated experimental-theoretical effort to arrive at important local atomic and electronic structure information in glassy alloys. During the three years covered by the contract, significant experimental and theoretical developments have taken place both in the general technical community and at General Electric which have had an important impact on the approach to this problem. This is particularly true in the theoretical area where two important advances, the development of a general Xα-LCAO approach, and the development of a general and accurate effective potential approach for density functional methods, have allowed us to construct a new computational capability which combines these two advances. Two subsections briefly review the experimental and theoretical technical developments, respectively. These developments have changed initial perspectives regarding research on local atomic and electronic structure in glassy metallic alloys. Section II presents a synopsis of our accomplishments during the contract period and Section III contains a more detailed discussion of some of these accomplishments, namely those portions of the work which have been published or submitted for publication at the time of writing this final report.

2561 **(DOE/ER/10740—4) Dislocation-assisted crack propagation in zinc.** Dew-Hughes, D.; Messmer, C.; Bilello, J.C. (Oxford Univ. (UK). Dept. of Engineering Science; Harris Semiconductor, Melbourne, FL (USA); State Univ. of New York, Stony Brook (USA). Dept. of Materials Science and Engineering). 1981. Contract AC02-80ER10740. 14p. NTIS, PC A02/MF A01. Order Number DE83000242.

The basal cleavage surface energy of pre-deformed zinc crystals has been shown to be a factor of twenty times smaller than the thermodynamic value. A theoretical model is presented which rationalizes this energy reduction based on the formation of sessile dislocations which exert a net force on the precursor crack. The model analyzes uniaxial tension as well as fatigue predeformation with results which have serious implications regarding the in-service reliability of materials.

2562 **(DOE/ET/12313—4) Characterizing and improving the toughness of thick-sectioned 2-1/4 Cr-1Mo electroslag weldments. Final report, June 30, 1978-October 30, 1981.** Edwards, G.R.; Frost, R.H. (Colorado School of Mines, Golden (USA). Dept. of Metallurgial Engineering). 1981. Contract AS05-78ET12313. 48p. (ORNL/Sub—7219/1). NTIS, PC A03/MF A01. Order Number DE83000875.

A functional relation between the major electroslag welding process variables of potential, current, and electrode velocity has been developed. A two-dimensional heat transport model has been developed for heat flow in the parent metal plates of electroslag welds. An energy balance has been developed for the electroslag welding process. Two-dimensional process variable plots have been developed which predict the correct operating conditions required for weld penetration in electroslag welds of 2-1/4 Cr-1 Mo steel. It was shown that oxygen pickup, tramp element pickup, and alloy element oxidation losses in electroslag welding are primarily caused by electrochemical rather than thermochemical reactions. An electrochemical cell was used to study cathode reactions and to obtain current efficiency data for oxygen pickup, alloy element oxidation losses, and Al pickup in 2-1/4 Cr-1 Mo electroslag welds. A relation has been developed for alloy and tramp element concentration changes. Welding and post-weld heat treatment procedures have been developed which provide excellent toughness in the fusion zones of 2-1/4 Cr-1 Mo steel welds without a re-austenization heat treatment. An experimental determination has been made of the microstructures which produce high toughness in 2-1/4 Cr-1 Mo steel weld fusion zones. 21 figures.

2563 **(DOE/ET/52015—T20) Helium generation in fusion-reactor materials. Progress report, July-September 1982.** Kneff, D.W.; Farrar, H. IV. (Rockwell International Corp., Canoga Park, CA (USA). Energy Systems Group). 1982. Contract AT03-76ET52015. 7p. NTIS, PC A02/MF A01. Order Number DE83001456.

Helium production measurements have been completed for the ^{6}Li and ^{10}B dosimeters irradiated in the Oak Ridge Research Reactor as part of the ANL-ORNL TRIO test irradiation. The ^{6}Li results were used to determine the $^{6}Li(n,\alpha)^{3}H$ tritium production rate for this irradiation.

2564 **(FRNC-TH—1057) Study by internal friction of dislocations, of defects created by electron beams and interactions in pure copper and pure silver.** Lauzier, J. (Institut National Polytechnique, 38 - Grenoble (France); Grenoble-1 Univ., 38 (France)). Jun 1981. 89p. (In French). NTIS (US Sales Only), PC A05/MF A01. Order Number DE82780756.

Thesis.

Variations of internal friction and elastic modulus of very pure materials (essentially copper and in some cases silver) are studied. Experimental informations are obtained in two fields: 1) Point defect study: defect creation and annihilation mechanisms are experimentally analyzed. Internal friction and modulus measurements allow the counting of the defects. Defect concentrations of 10^{-9} to 10^{-10} have been detected depending on temperature. This method allows the study of thermal variations of dislocation fixation by defects. 2) Dislocation mobility under low stress. In the temperature domain of the Bordoni peak the length of dislocations is an important parameter in the various theories interpreting this effect, as are others parameters like dislocation density Λ or internal stress s sub(i). Λ, s sub(i) and l all together are modified by strain hardening. Irradiation experiments with electron are complementary because only l is modified. A substructure has been evidenced in Bordoni peaks and by examination with a high energy electron microscope the nature of dislocations is identified. At higher temperature complex phenomena like the peaking effect or Hasiguti peaks are observed during electron irradiation. Annealing experiments show the temperature range of interstitial diffusion along dislocations.

2565 **(HMI-B—364) Compton scattering experiments at the HMI.** Bauer, G.E.W.; Pattison, P. (Hahn-Meitner-Institut fuer Kernforschung Berlin G.m.b.H. (Germany, F.R.)). Oct 1981. 107p. Dep. NTIS (US Sales Only), MF A01. Order Number DE82750530.

After summaries of the theory and the design of the apparatus as installed at the HMI, the handling of the raw data will be described in some detail. The data analysis and the presentation of the final results will be illustrated by means of recent measurements on copper single crystals.

2566 (INIS-mf—7059-Vol.2, pp vp) **Moessbauer and electrochemical corrosion studies of $Fe_{80}T_3B_{17}$ metallic glasses.** Takacs, L.; Lovas, A. (Hungarian Academy of Sciences, Budapest. Central Research Inst. for Physics); Vertes, A.; Kovacs, P.; Farkas, J.; Kiss, L. (Eoetvoes Lorand Tudomanyegyetem, Budapest (Hungary). Fizikai Kemiai es Radiologiai Tanszek). 1981. NTIS (US Sales Only), PC A22/MF A01.

From International conference on amorphuos systems investigated by nuclear methods; Balatonfuered, Hungary (31 Aug 1981).

The influence of the transition metals, T = Ti, V, Cr, Mn, Co, Ni, Ru, Os, and Pd on the Moessbauer characteristics and corrosion resistance of $Fe_{80}T_3B_{17}$ metallic glasses was studied. It was found that the additives improving magnetic properties reduce the corrosion resistance and vice versa. The changes of the isomer shift are interpreted in terms of changes of the electronic structure caused by alloying with transition metals.

2567 **(INIS-mf—7143) Diffusion of interstitial atoms in FCC metals after irradiation with 2 MeV electrons.** Kornmann, H. (Frankfurt Univ. (Germany, F.R.). Fachbereich Physik). 14 Feb 1980. 109p. (In German). NTIS (US Sales Only), PC A06/MF A01. Order Number DE83780001.

Thesis.

Self-diffusion in nickel after electron irradiation has been restudied. The diffusion velocity near the surface and the diffusion constant in the interior of the crystal have been determined as a function of radiation flux and temperature. A special method for the measurement of diffusion has been improved, which is based on radioactive tracer atoms for indication and on ion etching for the removal of thin films. To improve additionally the accuracy of the technique tracer atoms are induced into the crystal by thermal diffusion and then irradiated with 2 MeV electrons. (orig./GSCH).

2568 **(Juel—1721) Measurement of magnetization and study of $ZrZn_2$ superconductivity under pressure.** Cordes, H.G. (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Inst. fuer Festkoerperforschung). Jul 1981. 138p. (In German). NTIS (US Sales Only), PC A07/MF A01. Order Number DE82903822.

Thesis. Submitted to Univ. of Koeln, Germany. Portions of document are illegibles .

A determination is made of the magnetic properties of $ZrZn_2$ under pressure and whether this compound possesses the triplet-superconductivity property. Information is given on computing the band structure of the compound, methods for measuring magnetization and superconductivity, and the production of $ZrZn_2$. 37 references, 24 figures, 11 tables.

2569 **(Juel—1730) TV-system for investigating growth parameters during crystal growth from melts.** Gaertner, K.J. (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Zentrallabor fuer Elektronik). Aug 1981. 82p. (In German). Dep. NTIS (US Sales Only)MF A01. Order Number DE82902715.

Thesis. Submitted to Univ. of Aachen, Germany. Portions of document are illegible.

A descripition is given of a television system which allows the measuring of various parameters during the automatic growth process of monocrystals from melts for the purpose of subsequent physico-mathematical investigation. The system's characteristic properties as well as the criteria for selecting components for building the required circuitry are discussed. 44 references, 36 figures.

2570 (Juel-Conf—44, pp 56-65) **Thermodynamics of refractory metal - iron group metal phases.** Kleykamp, H. Oct 1981. Dep. NTIS (US Sales Only).

From 5. German-Yugoslav meeting on materials science and development; Simmerath-Rurberg, F.R. Germany (6 Apr 1981).

Gibbs energies of formation of intermetallic phases and relative partial Gibbs energies of the constituent metals in these alloys are necessary for the prediction and the understanding of reactions in the field of applied materials science. The knowledge of the stability of intermetallic phases is of certain interest in the hard metal field, because informations on possible reactions between the refractory carbide and the binder metal can determine the quality of the hard metal. Several methods for the Gibbs energy of formation measurements are illustrated. Calculations and predictions of the heat of formation and the thermodynamic stability of the intermetallic phases are discussed with a view to the model, gives by Miederna.

2571 (Juel-Conf—44, pp 89-104) **Directional grain growth during solid state and liquid phase sintering of W-Ni.** Puckert, F.; Kaysser, W.A.; Petzow, G. Oct 1981. Dep. NTIS (US Sales Only).

From 5. German-Yugoslav meeting on materials science and development; Simmerath-Rurberg, F.R. Germany (6 Apr 1981).

In the present investigation directional grain growth during solid state sintering of W-Ni was studied to compare the results from a phenomenological point of view with liquid phase sintering studies in this system and studies of boundary migration in thin foils in various other systems.

2572 **(Juel-Spez—94) Tensile tests on foil specimens of high-grade steel of the type 316 in the temperature range of 20 to 900°C.** Kraaij, G.J. (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Inst. fuer Festkoerperforschung). Dec 1980. 23p. (In German). Dep. NTIS (US Sales Only), MF A01. Order Number DE82750546.

Foil specimens in a thickness range of 20-500 μm are increasingly used in simulation experiments where neutron-induced changes of mechanical properties are simulated by light ion bombardment. For a reliable transfer of such data to bulk material, the mechanical behaviour of foil specimens in comparison with bulk specimens must be known. Results of tensile tests on cold worked and solution annealed type 316 stainless steel foils of 200 μm thickness carried out between 20 and 900°C show a good agreement of the mechanical characteristics of foil and bulk samples.

2573 **(Juel-Spez—96) Crystal fields in the SEsub(x)Ysub(1-x)Pd_3 and SEsub(x)Ysub(1-x)Al_2 alloys. An investigation using inelastic magnetic neutron scattering.** Walter, U. (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Inst. fuer Festkoerperforschung). Jan 1981. 122p. (In German). Dep. NTIS (US Sales Only), MF A01. Order Number DE82750196.

By the use of inelastic magnetic neutron scattering the positions of the crystal field transitions in the alloys SEsub(x)Ysub(1-x)Pd_3 and SEsub(x)Ysub(1-x)Al_2 (SE = Pr, Nd, Tb, Dy, Ho, Er, Tm ; x approx. equal to 0.05) were determined by substracting the spectra of these alloys from the reference spectra of YPd_3 and YAl_2. For all the alloys the x and W parameters could clearly be determined in the crystal field scheme of Lea, Leask and Wolf. The crystal field parameters calculated from x and W show a certain systematic behaviour as a function of atomic number, which however is inconsistent with the predictions of the point charge model. An examination of the crystal field linewidth corroberates the fact, that the magnetic interactions are almost completely suppressed in the SEsub(x)Ysub(1-x)Pd_3 alloys.

2574 **(KFK—3085) Creep-rupture-tests on the stainless steel X6CrNi 1811 (DIN 1.4948) in the frame of the Extrapolation-program . Pt. 3.** Solano, R.R.; Rivas, M. de las; Barroso, S.; Scirra, M.; Seith, B. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Material- und Festkoerperforschung; Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Projekt Schneller Brueter). May 1981. 77p. (In German). NTIS (US Sales Only), PC A05/MF A01. Order Number DE82750574.

The austenitic stainless steel X6CrNi1811 (DIN 1.4948) that is used as a structure material for the German Fast Breeder Reactor SNR 300 was creep-tested in a temperature range of 550-650°C under base material condition as well as welded material condition. The main point of this program (Extrapolation Program) lies in the knowledge of the creep-rupture-strength and creep-behaviour up to 3 x 10^4 hours at higher temperatures in order to extrapolate up to >= 10^5 hours for operating temperatures. In order to study the stress dependency of the minimum creep rate additional tests were carried out over temperature range of 550-750°C. The present report describes the state in the total running program with testtimes up to 55 000 hours. Besides the creep-rupture behaviour it is possible to make a distinct quantitative statement for the creep-behaviour and ductility. Extensive metallographic and electronmicroscopic examinations show the fracture behaviour and changes in structure.

2575 **(KFK—3145) Characterization of the chemical material behaviour using the method of the mechanical equation of states.** Ritzhaupt-Kleissl, H.J.; Ernst, W. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.)). Apr 1981. 69p. (In German). Dep. NTIS (US Sales Only), MF A01. Order Number DE82750542.

The elastic and non-elastic as well as the time-dependent mechanical material behaviour may be characterized by a special set of material equations. These equations are derived by using the mechanical equation of states approach. The deduction of this set of material equations from state-of-the-art relationships describing the material's microstructure and time-dependent deformation behaviour (creep) is shown. The practicability for describing instationary material behaviour by the deduced equations is shown. Special emphasis is put on the applicability of this set of material equations as a subroutine in a computer code for the analysis of nuclear fuel rods.

2576 **(KFK—3151) Precipitation behaviour of the titanium stabilized 15% Cr-15% Ni-1,2% Mo austenitic stainless steel.** Padilha, A.F. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Material- und Festkoerperforschung; Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Projekt Schneller Brueter; Karlsruhe Univ. (TH) (Germany, F.R.). Fakultaet fuer Maschinenbau). May 1981. 123p. (In German). NTIS (US Sales Only), PC A06/MF A01. Order Number DE82750575.

Thesis.

With the aid of various and complementary metallurgical investigations procedures, the precipitation behaviour of the 15% Cr-15% Ni-Mo-Ti-B austenitic stainless steel was studied over prolonged periods of time (2 min-12000 hrs) and in the temperature range of 823-1653 K. A total of four heats with varying boron content (30-100 ppm) and varying Ti/C-ratio (2.7-5.1) were investigated. Tensile and creep tests of samples subjected to different thermomechanical treatments were carried out at 873 K. Primary precipitates were identified as Ti(N,C), $Ti_2(S,C)$ and (Ti,Mo)C and their structure, composition, metallographic features (shape, size, colour, frequency, distribution and epitaxial growth) and thermal stability were studied. After solution heat treatment (1403 K) or cold working (15%) secondary precipitates were identified as secondary (Ti,Mo)C, $M_{23}C_6$ and $(Cr,Fe)_2B$. The boride phase which is known in the literature was identified for the first time in this type of steel. Time-temperature-precipitation diagrams for the secondary phases were determined and the precipitation behaviour was studied in detail. Predeformation, creep loading and contact with sodium do not promote the occurrence of new phases. However, predeformation and creep loading have a major influence on the precipitation behaviour. Recovery and recrystallization were also studied. Results of tensile and creep tests on selected samples show various possibilities of improving the mechanical properties with the thermomechanical treatment.

2577 **(KFK—3199) Influence of intercrystalline corrosion with uranium dioxide and simulated fission products on the mechanical properties of the cladding material DIN 1.4970.** Schaefer, L. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Material- und Festkoerperforschung). Jan 1982. 63p. (In German). NTIS (US Sales Only), PC A04/MF A01. Order Number DE82750656.

Flash tensile specimens made of 1.4970 austenitic steel were corroded by UOsub(2+X), to which the fission products Cs, I and Te had been added, at 650°C. After they had undergone corrosion, tensile tests were performed with the specimens and the different strength of corroded specimens as compared to non-corroded specimens was correlated to the measured reaction zone. To be able to describe quantitatively the change of mechanical properties of steel as a result of corrosion, a coefficient of efectiveness and ductility factor was defined.

2578 **(KFK—3230) Corrosion studies and mechanical tests on metallic materials for the design of packagings for vitrified high level wastes (HLW).** Stichel, W.; Smailos, E.; Koester, R. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Nukleare Entsorgungstechnik). Dec 1981. 72p. (In German). NTIS (US Sales Only), PC A04/MF A01. Order Number DE82750586.

Selective corrosion studies and mechanical tests were performed on various metallic materials in order to find out appropriate materials for the design of HLW packagings serving as a barrier in the repository. Besides the Cr-Ni steels to be used as the canister material according to the previous concept, three nickel-base alloys were investigated as well as a mild steel and the materials Ti 99.8-Pd and the steel X 1 CrMoTi 182 (ELA-ferrite). Since within the framework of accident studies for a repository in a rock salt, salt solutions are being considered as a potential corrosion medium, the corrosion tests were made under selecting conditions in a quinary salt solution at 170°C and 1 bar. The mechanical tests have shown

that the nickel-base alloys and most of the Cr-Ni steels undergo slight changes of their mechanical properties as a result of welding and annealing treatment, respectively. This provided the evidence for the suitability of these materials as canister materials. Owing to their high susceptibility to local corrosion attacks, above all to stress corrosion, Cr-Ni steels cannot take over the function of a barrier against brines. The materials Inconel 625, Incoloy 825, ELA ferrite and Ti-Pd resisted stress corrosion, but these materials are susceptible to pitting corrosion. High resistance to local corrosion attacks was exhibited by the materials Hastelloy C 4 and mild steel. After a period of testing of 432 days Hastelloy C 4 showed a uniform corrosion rate of less than 0.03 mm/a. The corrosion rate for mild steel 1.0566 was less than 0.25 mm/a in case of the initial material and less than 0.5 mm/a in case of the annealed material.

2579 **(LA-UR—82-1021) Explosion bonding: aluminum-magnesium alloys bonded to austenitic stainless steel.** Patterson, R.A. (Los Alamos National Lab., NM (USA)). 1982. Contract W-7405-ENG-36. 30p. (CONF-821101—3). NTIS, PC A03/MF A01. Order Number DE82014080.

From ASME winter annual meeting; Pheonix, AZ, USA (14 Nov 1982).

Portions of document are illegible.

The explosion bonding of 5000 series aluminum alloys to 300 series stainless steel alloys is summarized. The process technique involves a parallel gap arrangement with copper or aluminum bonding aids. Successful bonds have been achieved using either a single shot process for joining the trilayer clad or a sequential shot technique for each metal component. Bond success is monitored through a combined metallographic and tensile strength evaluation. Tensile properties are shown to be strongly dependent upon process parameters and the amount of intermetallic formation at the aluminum bond interface. Empirical data has been compared with experimental and destructive test results to determine the optimum procedures.

2580 **(LA-UR—82-2627) NMR studies of a nearly ferromagnet $TiBe_2$.** Takagi, S.; Yasuoka, H.; Smith, J.L.; Huang, C.Y. (Los Alamos National Lab., NM (USA); Tokyo Univ. (Japan). Inst. for Solid State Physics). 1982. 10p. (CONF-820929—8). NTIS, PC A02/MF A01. Order Number DE83000670.

From IUPAP international conference on magnetism; Kyoto, Japan (6 Sep 1982).

The microscopic magnetic properties of an itinerant electron paramagnet $TiBe_2$ have been investigated by Ti and Be NMR. It is shown that only the long-wave components of spin fluctuations are strongly exchanged-enhanced and play a predominant role. An explanation of maximum in X(T) at $T \approx 10^{\circ}K$ and the CW law of X at higher temperatures is also given.

2581 **(LBL—11519) Nonlinear effects of materials in laser cavities.** Hsu, R.H. (Lawrence Berkeley Lab., CA (USA)). Aug 1982. Contract AC03-76SF00098. 235p. NTIS, PC A11/MF A01. Order Number DE83001545.

Thesis.

The concept of adding intensity dependent losses to a laser cavity in order to control output pulse shape is reviewed. Background theory and models for Kerr liquids using ellipse rotation to achieve these inducible losses are developed. Detailed calculations and experiments are performed using the liquid crystal MBBA in a ruby laser cavity. The results support the theories and model. The proper choices of parameters to optimize the technique is discussed. Self focusing inside a laser resonator was found to play an important role in the lasing process. Its effects on laser output were investigated.

2582 **(LBL—13099) Solute-element partitioning and austenite stabilization in steels.** Sarikaya, M.; Thomas, G.; Steeds, J.W.; Barnard, S.J.; Smith, G.D.W. (Lawrence Berkeley Lab., CA (USA)). Aug 1982. Contract AC03-76SF00098. 13p. NTIS, PC A02/MF A01. Order Number DE83000544.

Portions of document are illegible.

Considerable amounts of thin film retained austenite have been found in low to medium carbon lath martensitic structural steels. The existence of this metastable phase at room temperature has been attributed to several mechanisms which involve diffusion and redistribution of carbon during the austenite to martensite transformation. In this investigation electron microscopy (TEM), convergent beam electron diffraction (CBED) and field ion-atom probe (FIAP) analysis methods have been utilized to measure the C and other solute element distributions in retained austenite, γ, and martensite laths, α'. Considerable carbon partioning to γ and to α'/γ interfaces occurs during cooling, but there was no detectable change in substitutional alloying elements (Cr, Mn, Ni, Si) between α' and γ. Thus while C plays a vital role in stabilization, it cannot account completely for this phenomenon. It is concluded that mechanical stabilization and the size effect are also major factors.

2583 **(LBL—14750) Effects of welding on weldment mechanical performance in two austenitic steels.** Strum, M.J. (Lawrence Berkeley Lab., CA (USA)). Jun 1982. Contract AC03-76SF00098. 76p. NTIS, PC A05/MF A01. Order Number DE83001400.

Thesis.

The effect of autogenous gas-tungsten arc-welding on the mechanical performance of two austenitic steels has been evaluated for cable jackets of force-cooled superconductor coils. The original candidate material was Nitronic 40, a nitrogen-strengthened stainless steel. The in-situ reaction heat treatment at 700°C necessary for the formation of the superconducting A15 phase results in severe degradation of the cryogenic tensile ductility in the weld metal. The search for an alternate material led to JBK-75, a modified A-286 type γ' precipitation hardening iron-based superalloy. Observations of a tensile strength mismatch between base metal and the weaker weld metal in JBK-75 prompted a study into the aging response in weldments of this alloy. Localized strain through slip step traces show an easy path of deformation within the solidification structure. Weldment strength varies with grain size. It was found that through post-weld annealing treatments at 950°C, prior to aging, weldment hardness levels can be matched. However, although increased strength levels are obtained in the weld metal, concomitant decreases in base metal strengths are suffered, presumably due to observed grain growth. 24 figures, 9 tables.

2584 **(LBL—14751) Quantitative analysis of fracture modes in cryogenic ^{9}Ni steel by stereo SEM technique.** Fior, G.O. (Lawrence Berkeley Lab., CA (USA)). Jun 1982. Contract AC03-76SF00098. 58p. NTIS, PC A04/MF A01. Order Number DE83000500.

Thesis.

Systematic three dimensional (3D) quantitative analyses of fracture surface on ^{9}Ni cryogenic steel are used to study the effect of temperature variations on the geometrical factors that describe the shape of ductile dimples (DD) and quasicleavage (QC) facets. Stereo SEM techniques combined with stereo photogrametry provide the tools to perform such analysis on standard Charpy specimens tested with appropriate instrumentation over a 300 degrees temperature range. Mechanical properties and tridimensional geometrical factors are found to be intimately related. The influence of temperature on DD and QC is considerably different, showing that quasicleavage is a transitional fracture mechanism that serves as a link between ductile and cleavage fracture.

2585 **(LBL—14845) Effect of spin-glass ordering on the specific heat of CuMn.** Brodale, G.E.; Fisher, R.A.; Fogle, W.E.; Phillips, N.E.; Van Curen, J. (Lawrence Berkeley Lab., CA (USA)). Aug 1982. Contract AC03-76SF00098. 13p. (CONF-820929—7). NTIS, PC A02/MF A01. Order Number DE83000513.

From IUPAP international conference on magnetism; Kyoto, Japan (6 Sep 1982).

High-precision measurements have shown the nature of the specific heat anomaly associated with the transition to the spin-glass phase in CuMn, and have been used to determine the entropy as a function of field and temperature.

2586 (MLM—2944) **Tensile strength as a function of thermal history of Inconel 718 and Inconel 625 alloys for glass-ceramic headers.** Rey, M.C.; Henderson, W.R. (Mound Facility, Miamisburg, OH (USA)). 11 Jun 1982. Contract AC04-76DP00053. 8p. NTIS, PC A02/MF A01. Order Number DE83000061.

Tensile strength tests were conducted on Inconel 718 specimens following a variety of heat treatments, and on as-received and heat-treated specimens of Inconel 625. A heat treatment cycle for Inconel 718 was found that represents an acceptable compromise between a thermal cycle that yields the strongest metal and one that least taxes a glass-ceramic material to which the Inconel 718 is bonded. Heat treating resulted in a moderate decrease in the tensile strength of the as-received Inconel 625.

2587 (NP—2904734) **Thickness dependence of the Galvano-magnetic properties of nickel films and the influence of hydrogen adsorption.** Draxler, W. (Erlangen-Nuernberg Univ., Erlangen (Germany, F.R.). Inst. fuer Physikalische und Theoretische Chemie). 29 Jul 1980. 158p. (In German). NTIS (US Sales Only), PC A08/MF A01. Order Number DE82904734.

Thesis.

The dependence of the electric resistivity. Hall effect and magneto-resistance of nickel films, produces under ultra-high vacuum conditions has been studied as a function of annealing procedure, temperature, film thickness and adsorption. Different evaporation and measuring conditions have been used as well as varions substrates and electrical circuits. The films have been produced by evaporation at temperatures of 82 K, 300 K and 320 K, and the measurements are performed at T = 288 K partly under vacuum conditions and partly under normal atmospheric conditions. The films vary in thickness between 7 nm and 97 nm. In addition to the measurements using individually evaporated thin films, also discontinuously produced multi-layer films have been studied.

2588 (ORNL/MIT—345) **Analysis of effect of temperature gradients on surface-tension phenomena in gas-tungsten-arc welds.** Lee, H.A.; Chien, P.S.J. (Massachusetts Inst. of Tech., Oak Ridge, TN (USA). School of Chemical Engineering Practice). Oct 1982. Contract W-7405-ENG-26. 57p. NTIS, PC A04/MF A01. Order Number DE83001679.

Fluid motion directed by surface tension is considered as a contributor to heat penetration in a weld pool. The potential phenomena at the gas-liquid interface were analyzed, and the dependence of surface motion on temperature in the gas-tungsten-arc (GTA) welding process was examined. An existing heat-transfer model was used and was able to predict weld size to +- 50% of the actual value. A momentum-transfer equation was derived by considering the contribution of Lorentz force. The momentum boundary condition was developed and was able to predict the Marangoni effect. The magnitude of surface-tension-driven force is comparable to the gravitational force on one gram. An empirical approach was proposed to couple heat-transfer and momentum-transfer phenomena. A dimensional analysis identified the pertinent dimensionless groups as Reynolds, Weber, Froude, Peclet, and Power numbers and a dimensionless velocity. A simplified form of the correction was developed by combining dimensionless groups to yield a correlation with the Bond, Prandtl, and modified power numbers. Future experimental work was proposed to test the functionality of the dimensionless groups.

2589 (ORNL/MIT—350) **Sodium sulfide slagging for removing copper from scrap steel.** Leis, J.R.; Sanghvi, S.M.; Steinberg, R.M. (Massachusetts Inst. of Tech., Oak Ridge, TN (USA). School of Chemical Engineering Practice). Oct 1982. Contract W-7405-ENG-26. 64p. NTIS, PC A04/MF A01. Order Number DE83001686.

Fundamental studies of sodium sulfide slagging for removing copper from scrap steel indicate that the copper distribution coefficient is 10, and that if 30 wt % FeS exists in the slag phase, no iron will be transferred to the slag from the metal phase. This process can be used commercially as an added fluxing step with minimal modifications to current electric-furnace steelmaking operations. Preliminary economic analysis shows an incremental return on investment equal to 100% per year.

2590 (SAND—82-0364C) **Plasma and magnetohydrodynamic problems in vacuum consumable arc remelting.** Bertram, L.A.; Zanner, F.J. (Sandia National Labs., Albuquerque, NM (USA)). 1982. Contract AC04-76DP00789. 55p. (CONF-820965—1). NTIS, PC A04/MF A01. Order Number DE83000083.

From IUTAM symposium on metallurgical applications of MHD; Cambridge, UK (6 Sep 1982).

Production of large homogeneous ingots of macrosegregation sensitive reactive alloys by the vacuum consumable arc remelting process depends on reliable control of the furnace. Such control is possible only when the normal operation is understood. A tightly coupled theoretical-experimental-numerical program has been under way for some time at Sandia in conjunction with other DOE and private facilities, aimed at achieving this understanding. The furnace arc and electrode surfaces have been studied by high speed cinematography, showing that basic arc behavior is similar to that reported in the arc physics literature for vacuum breaker switches with cold (unmelted) electrodes.

2591 (UCRL—53334) **Fluorescence line-narrowing studies of rare earths in disordered solids.** Hall, D.W. (Lawrence Livermore National Lab., CA (USA)). 10 Aug 1982. Contract W-7405-ENG-48. 228p. NTIS, PC A11/MF A01. Order Number DE83001483.

Thesis. Submitted to Univ. of California, Davis. Portions of document are illegible.

This dissertation is made up of two experimental studies dealing with apparently diverse topics within the subject of rare earths (RE) in solids. The first study, described in Part II, concerns the vibrations of a disordered host material about an optically active rare-earth ion as manifested by vibrationally-assisted-electronic, or vibronic transitions. Part III of the dissertation describes an investigation of the influence of site anisotropy on the purely electronic, laser transition of Nd^{3+} in glass. These two studies are bound together by the common experimental technique of laser-induced fluorescence line narrowing (FLN). By exciting fluorescence with monochromatic light of well-characterized polarization, one may select and observe the response of a single subset of the optically active ions and obtain information that is usually masked by the inhomogeneous nature of disordered solids.

2592 (UCRL—87686) **Modeled heating and surface erosion comparing motile (gas borne) and stationary (surface coating) inert particle additives.** Buckingham, A.C.; Siekhaus, W.J. (Lawrence Livermore National Lab., CA (USA)). 27 Sep 1982. Contract W-7405-ENG-48. 11p. (CONF-821043—1). NTIS, PC A02/MF A01. Order Number DE83000597.

From Tri-service symposium on gun tube wear and erosion; Dover, NJ, USA (25 Oct 1982).

Portions of document are illegible.

The unsteady, non-similar, chemically reactive, turbulent boundary layer equations are modified for gas plus dispersed solid particle mixtures, for gas phase turbulent combustion reactions and for heterogeneous gas-solid surface erosive reactions. The exterior (ballistic core) edge boundary conditions for the solutions are modified to include dispersed particle influences on core propellant combustion-generated turbulence levels, combustion reactants and products, and reaction-induced, non-isentropic mixture states. The wall surface (in this study it is always steel) is considered either bare or coated with a fixed particle coating which is conceptually non-reactive, insulative, and non-ablative. Two families of solutions are compared. These correspond to: (1) consideration of gas-borne, free-slip, almost spontaneously mobile (motile) solid particle additives which influence the turbulent heat transfer at the uncoated steel surface and, in contrast, (2) consideration of particle-free, gas phase turbulent heat transfer to the insulated surface coated by stationary particles. Significant differences in erosive heat transfer are found in comparing the two families of solutions over a substantial range of interior ballistic flow conditions. The most effective influences on reducing erosive heat transfer appear to favor mobile, gas-borne particle additives.

2593 **Some considerations on fatigue crack closure at near-threshold stress intensities due to fracture surface morphology.** Ritchie, R.O.; Suresh, S. (MIT, Cambridge, MA, USA). *Metallurgical Transactions, [Section] A: Physical Metallurgy and Materials Science;* **13A**: No. 5, 937-940(May 1982).

At near-threshold levels, in addition to the role of plasticity- and oxide-induced crack closure, fracture surface roughness or morphology may promote closure effects in plane strain. 36 refs.

2594 **Non-random site-occupation parameters in (C,F)/sub 23/C/sub 6/ phases.** Yakel, H.L.; Brynestad, J. (Oak Ridge Natl Lab, TN, USA). *Scripta Metallurgica;* **16**: No. 4, 453-454(Apr 1982).

Analyses of precise single-crystal x-ray diffraction data from (Cr/sub 23-x/Fe/sub x/)C/sub 6/ phases precipitated from Cr-Fe-C alloys equilibrated at 1200/degree/C can give reliable estimates of site-occupation parameters in the range 7.4/greater than equivalent to/x/greater than equivalent to/1.7. The distribution parameters are summarized. 6 refs.

2595 **Effects of Sb, Sn, As, and P additions on the high-temperature ductility of Ni.** White, C.L.; Padgett, R.A. (Oak Ridge Natl Lab, TN, USA). *Scripta Metallurgica;* **16**: No. 4, 461-466(Apr 1982).

This note reports low strain rate, 600/degree/C tensile test results on four single phase Ni-metalloid alloys and two undoped control heats of Ni. The four metalloid dopants (Sb, Sn, As, and P) were chosen because they are known to segregate to internal interfaces in Ni and/or Fe and they have large solid solubilities in Ni at 600/degree/C. Sb and Sn are the two most potent embrittlers, with As having an intermediate effect, and P inducing no intergranular cracking. 9 refs.

2596 **Effects of strain state and strain rate on deformation-induced transformation in 304 stainless steel - 1. magnetic measurements and mechanical behavior.** Hecker, S.S.; Stout, M.G.; Staudhammer, K.P.; Smith, J.L. (Los Alamos Natl Lab, NM, USA). *Metallurgical Transactions, [Section] A: Physical Metallurgy and Materials Science;* **13A**: No. 4, 619-626(Apr 1982).

The /gamma/sub yields/sub alpha/sub prime/ transformation in 304 stainless steel can be induced by plastic deformation at room temperature. The authors used magnetic techniques to monitor progress of the transformation in sheet loaded in uniaxial and biaxial tension at both low (10/sup -3/ per second) and high (10/sup 3/ per second) strain rates. Uniaxial tension tests were conducted at temperatures ranging from 50 to -80/degree/C. Both the strain hardening and transformation rates increased with decreasing temperature. The transformation saturates at 85 pct volume fraction /alpha/sub prime/. 28 refs.

2597 **Effects of strain state and strain rate on deformation-induced transformation in 304 stainless steel - 2. microstructural study.** Murr, L.E.; Staudhammer, K.P.; Hecker, S.S. (Oreg Grad Cent, Beaverton, USA). *Metallurgical Transactions, [Section] A: Physical Metallurgy and Materials Science;* **13A**: No. 4, 627-635(Apr 1982).

The authors examined the transformation products from uniaxial and biaxial experiments at both low and high strain rates to check how well the assumptions made in the Olson-Cohen analysis apply and to determine if the conclusions reached from the macroscopic observations in Part I can be substantiated microstructurally. 19 refs.

2598 **Anomalous diffusion of carbon in a 70/30 iron-nickel alloy.** Chapman, L.R.; Powers, D.A.; Wuttig, M. (Univ of Mo, Rolla, USA). *Scripta Metallurgica;* **16**: No. 4, 437-440(Apr 1982).

The experimentally observed low temperature diffusion anomaly of carbon in Fe-29.9 wt% Ni is thought to represent the effect of local heterophase fluctuations on the antisymmetrical part of the activation energy of interstitial diffusion. 20 refs.

2599 **Application of the McNabb-Foster trapping equations to the diffusion of oxygen in dilute niobium alloys.** Frank, R.C.; Lauf, R.J.; Altstetter, C.J. (Augustana Coll, Rock Island, IL, USA). *Metallurgical Transactions, [Section] A: Physical Metallurgy and Materials Science;* **13A**: No. 4, 539-543(Apr 1982).

McNabb-Foster equations have been applied to data reported by Lauf and Altstetter. The merits and limitations of various are discussed. Initial fractional trap occupancies were also calculated and plotted against 1/T. 10 refs.

2600 **Fatigue behaviour of welded joints between dissimilar metals (austenitic stainless steels and low alloy steels).** Amzallag, C.; Rabbe, P. (Societe Creusot-Loire, 42 - Firminy (France)); Bernard, J.L.; Slama, G. (Framatome, 92084 Paris La Defense, France). pp 2071-2078 of Advances in fracture research (Fracture 81). Volume 5. Francois, D. Oxford, England; Pergamon Press (1982).

From 5. international conference on fracture; Cannes, France (29 Mar 1981).

To evaluate the cyclic behaviour of the junction between austenitic stainless steel pipes and low alloy steel nozzles, fatigue tests have been performed on a simulated welded joint. The low cycle fatigue and crack growth behaviours of the junction were evaluated. The number of cycles to initiate a fatigue crack and the relationship between propagation paths and the metallurgical structure were determined. The results obtained showed the influence of the microstructure on the initiation and propagation of fatigue cracks in this heterogeneous joint.

2601 **Dynamic elastic-plastic characterization of nuclear pressure vessel material.** Angelino, G.; Fossati, C. (Centro Informazioni Studi Esperienze, Milan (Italy)). pp 2345-2352 of Advances in fracture research (Fracture 81). Volume 5. Francois, D. Oxford, England; Pergamon Press (1982).

From 5. international conference on fracture; Cannes, France (29 Mar 1981).

In this work a new type of test is described, which strongly implements standard tests techniques, like pre-cracked instrumented Charpy, widely used to characterize pressure vessel steels.

2602 **Interaction of damage mechanisms during high temperature fatigue.** Plumtree, A. (Waterloo Univ., Ontario (Canada). Dept. of Mechanical Engineering); Lemaitre, J. (Paris-6 Univ., 75 (France)). pp 2379-2384 of Advances in fracture research (Fracture 81). Volume 5. Francois, D. Oxford, England; Pergamon Press (1982).

From 5. international conference on fracture; Cannes, France (29 Mar 1981).

Alloy 800 (Sandvik-Sanicro 31) has been subjected to fully reversed push-pull strain controlled tests at 600°C. High and low strain rates were imposed by controlling the test frequency. The conditions for these strain rates were chosen on the basis of fracture analysis. The failure at the low strain rate was entirely intercrystalline whereas that at the high strain rate was completely transcrystalline and striated. Tests were carried out by mixing sequences of cyclic creep (intercrystalline) and fatigue damage. On considering the accumulation of damage in a non-linear manner, it was found that this approach gave a unified explanation to the observed results. It is shown that interaction occurs between the cyclic creep and fatigue mechanisms after a certain amount of prior damage has been imposed.

2603 **Effect of hold times on the elevated temperature fatigue crack growth behavior of Inconel 718 alloy.** Pedron, J.P.; Pineau, A. (Ecole Nationale Superieure des Mines, 91 - Evry (France). Centre des Materiaux). pp 2385-2392 of Advances in fracture research (Fracture 81). Volume 5. Francois, D. Oxford, England; Pergamon Press (1982).

From 5. international conference on fracture; Cannes, France (29 Mar 1981).

The effect of tensile hold times on the fatigue crack growth rate of Inconel 718 was studied at 923 K. It was found that the superimposition of hold times (Th) can produce a drastic increase in the fatigue crack growth rate. Potential drop technique was used to

analyse the crack propagation which takes place in certain conditions either during the cyclic part of the loading or during the dwell period. In this high strength and low ductility material an expression has been found for an upperbound of the crack growth rate.

2604 **Hold time effects on low cycle fatigue properties of 316 L stainless steel at 600°C and 650°C.** Rezgui, B.; Petrequin, P.; Mottot, M. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Dept. de Technologie). pp 2393-2402 of Advances in fracture research (Fracture 81). Volume 5. Francois, D. Oxford, England; Pergamon Press (1982).

From 5. international conference on fracture; Cannes, France (29 Mar 1981).

In order to clarify time and temperature dependent behaviours of austenitic stainless steels, completely reversed (strain) controlled push-pull fatigue tests were conducted on 316 L type steel in air at 600°C and 650°C. The effects of hold time imposed on tensile strain was investigated at different strain levels. Under these conditions, a pronounced decrease in fatigue life was observed. For each temperature the importance of this effect depended on the length of hold time and on the strain amplitude. At 600°C results showed a continuous reduction in fatigue life with increasing hold time while a saturation effect was observed in tests at 650°C. Extensive microstructural damage was seen on the majority of specimens subjected to hold time strain cycling; the changes were similar in the material at both temperatures but differing more in degree than in nature. For continuous cycling the fracture occurred by initiation and propagation of a transgranular crack. For tests with hold time, creep damage in material was produced during periods of tensile stress relaxation leading to intergranular cracking, both at the surface and in the bulk of specimens and causing a change in the failure mode which became predominantly intergranular.

2605 **Characterizing and predicting crack growth behavior in alloys at elevated temperature.** Saxena, A. (Banaras Hindu Univ., Varanasi (India). School of Material Science and Technology); Shih, T.T. (Westinghouse Research and Development Center, Pittsburgh, PA (USA)). pp 2403-2412 of Advances in fracture research (Fracture 81). Volume 5. Francois, D. Oxford, England; Pergamon Press (1982).

From 5. international conference on fracture; Cannes, France (29 Mar 1981).

It has been shown in the literature that K^3/t, where K = stress intensity parameter and t = time, uniquely characterizes the stress and strain rate in the crack tip region under small scale creep conditions for materials obeying the power law creep behavior. Similarly, for large scale creep conditions, it has been shown that the C^* line integral characterizes the crack tip conditions. This paper briefly reviews these stress analyses and presents considerable crack growth rate data developed under cyclic and static loading conditions on ASTM A470 class 8 steel at 538°C and AISI 304 stainless steel at 594°C. These data clearly show that K and C^* also characterize the crack growth rate behavior at elevated temperature under conditions of small scale creep and large scale creep, respectively. Mathematical models, proposed by the authors, for predicting and representing the influence of frequency and hold time on fatigue crack growth rate are evaluated with experimental data. Good correlations between the predicted behavior and the data were obtained. Limitations of the models are also discussed.

2606 **Elevated temperature, low cycle fatigue of AISI 316 stainless steel.** Thorpe, T.W. (UKAEA Atomic Energy Research Establishment, Harwell. Materials Development Div.); Smith, G.C. (Cambridge Univ. (UK). Dept. of Metallurgy and Materials Science). pp 2413-2421 of Advances in fracture research (Fracture 81). Volume 5. Francois, D. Oxford, England; Pergamon Press (1982).

From 5. international conference on fracture; Cannes, France (29 Mar 1981).

Elevated temperature, low cycle fatigue tests were carried out on AISI 316 stainless steel. The effect on fatigue endurance and crack growth of testing environment, cyclic strain rate and plastic strain range were studied. Environment was shown to exercise a great influence on fatigue lives through its effect on both crack nucleation and crack propagation. The deleterious effect of decreasing the cyclic strain rate was shown to be part of a complex interaction with plastic strain range which influenced both crack initiation and propagation.

2607 **Initiation and growth of fatigue cracks at high temperature.** Plumtree, A. (Waterloo Univ., Ontario (Canada). Dept. of Mechanical Engineering); Douglas, M.J. (Westinghouse Canada Ltd., Hamilton, Ontario. Atomic Power Div.). pp 2423-2429 of Advances in fracture research (Fracture 81). Volume 5. Francois, D. Oxford, England; Pergamon Press (1982).

From 5. international conference on fracture; Cannes, France (29 Mar 1981).

A series of fully reversed cyclic tests were carried out on Sanicro 31 (Alloy 800) specimens at 600°C. The majority of these tests were conducted on axially loaded smooth specimens at various strain levels using a high strain rate of 2.64×10^{-1} sec^{-1}, supplemented by tests carried out at a low strain rate of 1.32×10^{-4} sec^{-1}. Fatigue (transcrystalline) cracks formed in several small and localized areas on the surface at the high cyclic strain rate. Coalescence of these small cracks forming a common crack front occurred at approximately half life. Once this life fraction had been exceeded, imposition of low strain rate cycles causing intercrystalline cracking resulted in interaction between these two damage mechanisms. Stress response measurements allowed the concept of non-linear damage accumulation to be applied to this work. The damage accumulation rate was found to be directly related to the fatigue crack growth rate.

2608 **Fatigue crack initiation and propagation at elevated temperature.** Teranishi, H. (Sumitomo Metals, Inc., Amagasaki (Japan)); McEvily, A.J. (Connecticut Univ., Storrs (USA). Inst. of Materials Science). pp 2439-2447 of Advances in fracture research (Fracture 81). Volume 5. Francois, D. Oxford, England; Pergamon Press (1982).

From 5. international conference on fracture; Cannes, France (29 Mar 1981).

The purpose of the present study is to determine microstructural influences on low cycle, elevated temperature fatigue behavior by comparing two austenitic alloys, Alloy 800 and 800 H with two ferritic alloys, 2 1/4 Cr-1 Mo and 2 1/4 Cr-1 Mo-V. Attention is given to the determination of the number of cycles to initiate a 0.1 mm crack as well as to the effects of oxidation, particularly when hold times are included in the loading cycle. Alloy 800 and Alloy 800 H were tested at 500°C and 650°C. The 2 1/4 Cr-1 Mo alloys were tested at 593°C. The mechanical properties at room temperature and the elevated test temperatures are listed. Processing details are given and discussed.

2609 **Fracture behavior and deformation mechanisms under fast neutron irradiation.** Boutard, J.L.; Dupouy, J.M. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Dept. de Technologie). pp 2459-2465 of Advances in fracture research (Fracture 81). Volume 5. Francois, D. Oxford, England; Pergamon Press (1982).

From 5. international conference on fracture; Cannes, France (29 Mar 1981).

The out-of-pile and in-pile deformation mechanism maps of a 316 stainless steel irradiated in a fast reactor have been established. The knowledge of the dominating deformation mechanism either in post irradiation creep experiments or during the in-pile steady state operating conditions allows to rationalize the apparent discrepancy between the very low out-of-pile ductility and the rather high plastic diametral strains which are obtained in the fast reactor environment without fracture.

2610 **Crack-arrest tests of irradiated high-copper ASTM A508 submerged-arc weld metal.** Marschall, C.W.; Rosenfield, A.R. (Battelle Columbus Labs., OH (USA)). pp 2467-2475 of Advances in fracture research (Fracture 81). Volume 5. Francois, D. Oxford, England; Pergamon Press (1982).

From 5. international conference on fracture; Cannes, France (29 Mar 1981).

Experiments were conducted on SA weld-metal specimens removed from an ASTM A508 Class 2 steel pressure-vessel nozzle

cutout to assess the effect of exposure to fast neutrons on strength, toughness, and crack-arrest behavior. The weldment contained about 0.3 pct. copper, which is typical for weldments employed in some of the early light-water reactors. Exposure to 0.6 to 1.0 x 10^{19} n/cm^2 (E >= 1 MeV) at 280°C caused the tensile yield strength to be raised by 25 to 30 pct., the Charpy shelf-energy to decrease by about 45 pct., and the 50 J (35 ft-lb) Charpy-energy transmission temperature to increase about 120°C. Because of the limited number of tests, no firm conclusions were drawn on the effect of irradiation on crack-arrest properties. However, the data suggest that the shifts in transition temperature for both Ksub(ID) and Ksub(Ia) were no greater than the shift in the 50 J Charpy-energy-transition temperature or than the shift in RTsub(NDT) predicted on the basis of the copper content of the steel.

2611 **New techniques for electropolishing NB, TA, ZR, and TI for transmission electron microscopy.** Schober, T.; Westlake, D.G. (Argonne Natl Lab, IL, USA). *Metallography;* **14**: No. 4, 359-362(Dec 1981).

This work describes new electrolytes for Nb and Ta based on solutions of ammonium fluoride (NH/sub 4/F) in methanol and electrolytes for Zr and Ti consisting of concentrated solutions of magnesium perchlorate [Mg(ClO/sub 4/)/sub 2/] in methanol. 10 refs.

2612 **Sulfur and phosphorus segregation to creep cavities and grain boundaries in 304 SS.** White, C.L.; Padgett, R.A.; Swindeman, R.W. (Oak Ridge Natl Lab, TN, USA). *Scripta Metallurgica;* **15**: No. 7, 777-782(Jul 1981).

Extensive segregation of sulfur to grain boundary cavities has been observed in crept type 304 stainless steel. Less extensive segregation of phosphorus to grain boundaries was also observed. It is suggested that this segregation is somehow related to its unusually short rupture life and low ductility. Several possible mechanisms for this segregation-induced effect can be suggested, but the effects of the segregants on grain boundary and surface diffusivities as well as grain boundary sliding must first be determined. 16 refs.

2613 **Effect of Se partial pressure on intergranular embrittlement of a Pt-Rh-W alloy.** White, C.L.; Keiser, J.R.; Heatherly, L.; Newsome, J.F. (Oak Ridge Natl Lab, TN, USA). *Scripta Metallurgica;* **15**: No. 7, 805-808(Jul 1981).

This note presents additional experimental results concerning the effect of P/sub Se/ on the degree of intergranular embrittlement and the extent of Se contamination at Pt +30 wt % Rh +8 wt % W Alloy (Pt-3008) grain boundaries. 8 refs.

2614 **(RFP-Trans—336) Recommendations on electron-beam welding of aluminum alloys.** Brillant, M.; de Bony, Y. Translated from *Revue de l'Aluminium ;* 379-383(Aug-Sep 1980). Contract AC04-76DP03533. 12p. NTIS, PC A02/MF A01. Order Number DE82020135.

Portions of document are illegible.

In the aeronautics, space and nuclear industries, such alloys have benefitted greatly from experimental research on their weldability by electron beams. This paper discusses the characteristics of the welded joint and the design of assemblies welded by the technology of electron bombardment. 5 figures, 6 tables.

2615 **Huang diffuse scattering from dislocation loops.** Larson, B.C. (Oak Ridge National Laboratory, TN); Schmatz, W. *Physica Status Solidi [Sectio] B: Basic Research;* **99**: 267-275(1980). Contract W-7405-ENG-26.

Numerical diffuse scattering calculations are carried out for interstitial dislocation loops on {111} planes in aluminum using numerical displacement fields calculated for an elastically isotropic medium. Calculations are performed along selected directions near the (400), (200), (220), and (222) reciprocal lattice points. The results are found to be in qualitative agreement with the predictions of analytical diffuse scattering models; however, for quantitative results, detailed numerical calculations are found to be necessary.

2616 **Ductile failure via a homogeneous strain field.** Hopper, R.W. (Univ. of California, Livermore). *Materials Science and Engineering;* **45**: 21-33(1980).

The conditions under which a cylindrical rod of ductile material can neck to zero radius with finite total elongation are investigated. Let the constitutive equation be $\dot{\delta} = f(\epsilon)\dot{\epsilon}/\sup .m/$ where $f(\epsilon)$ is bounded by a power law at large strains. The the rod undergoes infinite elongation when $m > 1/2$; it necks to zero radius with finite elongation and a diffuse neck if $1/3 < m < 1/2$; the neck sharpens to a notch if $m < 1/3$. Model constitutive laws are used to elucidate further the necking behavior, including the effects of capillarity and of a yield stress. The applicability of the formal results to real situations, including the possible effects of dissipative heating, is discussed. Possible applications to certain examples of failure in tension of ductile metals, to the final rupture of an alloy glass and to the fracture toughness of a ductile metal are discussed.

3602 Ceramics, Cermets, And Refractories

REFER ALSO TO CITATION(S) 1695, 1696, 1697, 1699, 1700, 1754, 1843, 2097, 2160, 2163, 2164, 2446, 2505, 2575, 2610

2617 **(AD-A—113937/7) Requirements for flexure testing of brittle materials. Final report.** Baratta, F.I. (Army Materials and Mechanics Research Center, Watertown, MA (USA)). Apr 1982. 53p. NTIS, PC A04/MF A01.

Requirements for accurate bend-testing of four-point and three-point beams of rectangular cross-section are outlined. The so-called simple beam theory assumptions are examined to yield beam geometry ratios that will result in minimum error when utilizing elasticity theory. Factors that give rise to additional errors when determining bend strength are examined, such as; wedging stress, contact stress, load mislocation, beam twisting, friction at beam contact points, contact point tangency shift, and neglect of corner radii or chamfer in the stress determination. Also included are the appropriate Weibull strength relationships and an estimate of errors in the determination of the Weibull parameters based on sample size. Error tables, based on many of the previously mentioned factors, are presented. Such data are utilized to rationally arrive at a 1/3-four-point and a three-point beam of a specific geometry ratio and dimension that will result in minimization of errors during flexure testing. Although such beams are recommended for a military standard, they are termed reference standard beams. Beams of other loading configurations and dimensions are considered acceptable if statistical correlation to one of the reference standards is determined, and if error spans are reported when presenting flexure test data.

2618 **(ANL-CEN-RSD—82-1) Vapor pressures and vapor compositions in equilibrium with hypostoichiometric plutonium dioxide at high temperatures.** Green, D.W.; Fink, J.K.; Leibowitz, L. (Argonne National Lab., IL (USA)). Jun 1982. Contract W-31-109-ENG-38. 52p. NTIS, PC A04/MF A01. Order Number DE83000930.

Vapor pressures and vapor compositions in equilibrium with a hypostoichiometric plutonium dioxide condensed phase have been calculated for the temperature range $1500 \leqq T \leqq 4000$ K. Thermodynamic functions for the condensed phase and for each of the gaseous species were combined with an oxygen-potential model to obtain the partial pressures of O_2, O, Pu, PuO, and PuO_2. New thermodynamic functions for the solid oxide were calculated from available information and from new estimates of the heat capacity of the liquid. Thermodynamic functions for the vapor species were calculated previously. A suitable oxygen-potential model has been used previously for the solid hypostoichiometric plutonium dioxide; this model has been extended into the liquid region using several alternative methods. The effects of these alternatives on the calculated oxygen pressures have been examined in detail.

2619 **(ANL-CEN-RSD—82-3) Tables of thermodynamic and transport properties of UO_2.** Fink, J.K. (Argonne National Lab., IL (USA)). Jun 1982. Contract W-31-109-ENG-38. 105p. NTIS, PC A06/MF A01. Order Number DE83000922.

Portions of document are illegible.

The thermodynamic and transport properties of solid and liquid UO_2 are tabulated as a function of temperature. Properties are given for the temperature range 298.15 K to 3120 K for solid UO_2 and from 3120 to 6000 K for liquid UO_2. Thermodynamic properties tabulated include enthalpy, heat capacity, pressure, densi-

ty, instantaneous thermal expansion coefficient, compressibility, thermal pressure coefficient, and speed of sound. Tabulated transport properties include thermal conductivity, thermal diffusivity, emissivity, electrical conductivity, and viscosity. Tables are given in SI units and cgs units.

2620 **(DOE/ER/03420—9) Ceramic research on transformation superplasticity and stoichiometry efects on fracture. Final report.** Bradt, R.C. (Pennsylvania State Univ., University Park (USA). Dept. of Materials Science and Engineering). Dec 1981. Contract AC02-76ER03420. 6p. NTIS, PC A02/MF A01. Order Number DE83001133.

The research focused on three technical areas, domain boundaries in ferroelectrics, superplasticity associated with phase transitions in ceramics, some of a nonstoichiometric nature and some exposed to ^{60}Co gamma irradiation. The domain boundary studies yielded direct measurements of the widths of 90° domain boundaries, the transformational superplasticity studies resulted in the only data to date dealing with strains resulting from superimposed external stresses on ceramics undergoing phase transitions. These results are now being applied to the spinel-olivine transformation relating to plate tectonics, even though the phase transitions that were studied in this project are thermally induced as opposed to pressure induced. Studies of ^{60}Co irradiation effects on CaF_2 single crystals show irradiation toughening.

2621 (INIS-mf—6819, pp 538) **Measurements of gradients of electric fields acting on Gd nuclei in monocrystals of Ce, Pr, Gd fluorides, and sulfates.** Budzynski, M.; Kochetov, O.I.; Lizyrei, G.; Lyatushinski, A.; Mikolaichak, P.; Muminov, A.I.; Subotovich, M.; Khazratov, T. 1981. (In Russian). NTIS (US Sales Only), PC A99/MF A01.

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

2622 (INIS-mf—6819, pp 540) **Study of the temperature dependence of hyperfine fields on ^{181}Ta and ^{57}Fe in (Zn/sub 0,9/Hf/sub 0,1/)Fe$_2$ by the methods of perturbed angular correlation and the Moessbauer effect.** Aksel'rod, Z.Z.; Komissarova, B.A.; Kryukova, L.N.; Ryasnyj, G.K.; Sorokin, A.A. 1981. (In Russian). NTIS (US Sales Only), PC A99/MF A01.

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

2623 (Juel-Conf—44, pp 34-55) **Stable and metastable phase equilibria in the Si-Mg-O-N system.** Weiss, J.; Mueller, R.; Lukas, H.L.; Petzow, G.; Tien, T.Y. Oct 1981. Dep. NTIS (US Sales Only), MF A01.

From 5. German-Yugoslav meeting on materials science and development; Simmerath-Rurberg, F.R. Germany (6 Apr 1981).

Earlier investigations including the study of phase equilibria in the system Si-Mg-O-N as well as material properties and the densification behavior leave a number of questions open: The phase equilibria studies impose several contradicting phase relations. These contradictions should be clarified. Furthermore, the reaction kinetics during the equilibration should be studied in order to explain, why such contradictions can arise. Finally the knowledge of the phase relations should allow to choose material compositions, that yield materials with a good high temperature strength and creep resistence. The phase equilibria should be investigated by experiment and additionally by thermodynamic calculations.

2624 (Juel-Conf—44, pp 67-76) **Solid solutions and phase equilibria in (U,Zr,Ln)-oxides.** Schleifer, F.; Naoumidis, A.; Nickel, H.; Spelthann, H. Oct 1981. Dep. NTIS (US Sales Only).

From 5. German-Yugoslav meeting on materials science and development; Simmerath-Rurberg, F.R. Germany (6 Apr 1981).

The aim of these studies is to investigate the mixed crystals with CaF_2 crystal lattice, which are formed between UO_2, ZrO_2 and Ln oxides (rare earth). In order to insure homogeneous solid solutions with a good crystallization behaviour, the method of hydrolysis was used. Additional U-FP oxides were produced to check the results of quasi-binary and quasi-ternary (U,Zr,Ln) oxide systems for their transferability to the polynary system which forms the oxide matrix in irradiated fuel. Different methods of evaluation were required for determining the lattice parameters because the individual specimens exhibited large differences with regard to crystallization. The lattice parameters of these oxides change monotonously with composition, but they are generally smaller than expected taking account of the ion radii of the metals. Presumably, the effective radii of the crystal components are different from those cited in the literature due to the stabilization of uranium in higher valence and the deformation of O^{2-}-ion caused on the nonpure ion chemical bonding.

2625 (Juel-Conf—44, pp 77-87) **Thermal stability of calcium uranates in air and oxygen.** Kosec, M.; Reynen, P. Oct 1981. Dep. NTIS (US Sales Only).

From 5. German-Yugoslav meeting on materials science and development; Simmerath-Rurberg, F.R. Germany (6 Apr 1981).

1. Thermal behaviour of Ca_3UO_6, Ca_2UO_5, $CaUO_4$, $Ca_2U_3O_{11}$ and CaU_2O_7 was studied by DTA, quasiisothermal thermogravimetry and the quenching technique up to 1400°C in air and oxygen. The temperatures of reactions were determined and the reaction products were identified by the X-ray technique. 2. All reaction temperatures strongly depend on oxygen partial pressure and are lower in air than in oxygen.

2626 **(KFK—3201) Optical constants of liquid UO_2 in the visible spectral range obtained from reflectivity measurements.** Bober, M.; Singer, J.; Wagner, K. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Neutronenphysik und Reaktortechnik; Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Projekt Schneller Brueter). Oct 1981. 32p. (CONF-8106164—2). Dep. NTIS (US Sales Only), MF A01. Order Number DE82750197.

From National Bureau of Standards joint conferences: 8. symposium on thermophysical properties; 17. thermal conductivity conference; 8. thermal expansion conference; Gaithersburg, MD, USA (15 Jun 1981).

The optical constants, n,k, of liquid urania were determined from reflectivity measurements with plane-polarized light. Measurements were made with an integrating-sphere laser reflectometer in the wavelength range 450-750 nm at temperatures between 3000 and 4000 K. Consistent results have been obtained for different angles of incidence. The optical constants show little variation with the wavelength and temperature. Liquid urania proves to be opaque to radiation in the whole spectral range studied. Average values of $n = 1.7$ and $k = 0.8$ are given for the temperature range 3100-3600 K. From this result it is concluded that internal thermal radiation cannot cause a significant increase in thermal conductivity of urania upon melting.

2627 **(MLM—2996-OP) Low-temperature oxygen diffusion in alpha titanium characterized by Auger-sputter profiling.** Wittberg, T.N.; Wolf, J.D.; Keil, R.G.; Wang, P.S. (Dayton Univ., OH (USA). Research Inst.; Dayton Univ., OH (USA). Dept. of Chemistry; Mound Facility, Miamisburg, OH (USA)). 1982. Contract AC04-76DP00053. 17p. (CONF-821111—4). NTIS, PC A02/MF A01. Order Number DE82021312.

From 29. national symposium on American Vacuum Society; Baltimore, MD, USA (16 Nov 1982).

Anodic TiO_2 films were grown on titanium foils under galvanostatic conditions at 20 mA/cm^2 in an aqueous saturated solution of ammonium tetraborate. The samples were then heat treated at temperatures between 450 and 550°C and changes in the profile of oxygen concentration as a function of depth were monitored using AES. The oxygen diffusivities were calculated from the Boltzmann-Matano method and compared with those obtained using an analytical solution to Fick's Second Law. The activation energy for oxygen diffusion in this temperature range was then calculated to be 28 kcal/mole. 5 figures, 1 table.

2628 **Effects of neutron irradiation on the fracture of silicon carbide.** Malloy, J.W.; McKenzie, J.M.; Corelli, J.C. (Rensselaer Polytechnic Inst., Troy, NY (USA). Dept. of Nuclear Engineering). pp 2477-2484 of Advances in fracture research (Fracture 81). Volume 5. Francois, D. Oxford, England; Pergamon Press (1982).

From 5. international conference on fracture; Cannes, France (29 Mar 1981).

The fracture of two phase siliconized SiC containing 8 to 10 wt% excess silicon was determined after neutron irradiation to a fluence of 1.2 x 10^{25} n/m^2 (E > 1 MeV) with sample temperature < approximately 473°K during irradiation. High temperature (1473°K) fracture of samples with one as fired surface in tension exhibit no decrease in fracture strength within experimental error. The Weibull modulus giving an indication of strength scatter is not significantly affected by irradiation. The mode of fracture for both irradiated and unirradiated material is primarily transgranular as determined by scanning electron microscopy. Radiation-induced swelling and thermal conductivity changes saturate after a fluence of approximately 4 x 10^{24} n/m^2 and most of the annealing of electrical resistivity occurs in the 500 to 1100°K temperature range. Results on SiC irradiated at a temperature of 1373°K are also included in this paper.

2629 **Delayed failure of plasma-sprayed Al/sub 2/O/sub 3/ applied to metallic substrates.** Ferber, M.K.; Brown, S.D. (Oak Ridge Natl Lab, TN, USA). *Journal of the American Ceramic Society;* **64**: No. 12, 737-743(Dec 1981).

Aluminum oxide coatings were applied to the ends of cylindrical metal samples of both 316L stainless steel and Ti-6Al-4V ELI by a plasma spray process. These samples, fabricated into 4-point bend specimens, were used to determine both the strength and slow crack growth characteristics. The data obtained indicated that both systems were susceptible to stress corrosion. 31 refs.

2630 **Solid-state reactions in the system pbo-tio/sub 2/-zro/sub 2/.** Hankey, D.L.; Biggers, J.V. (Pennsylvania State Univ., University Park, USA). *Journal of the American Ceramic Society;* **64**: No. 12, C.172-C.173(Dec 1981).

The reaction sequence and the calcination reaction diagrams for the formation of lead zirconate titanate (PZT) solid solutions were investigated. The formation reactions were studied by differential thermal analyses, wet chemical titrimetric techniques for determining uncombined PbO, and by X-ray diffraction for phase determinations as a function of calcining temperatures and times. 7 refs.

2631 **Fracture of Al/sub 2/O/sub 3/ in combined tension/torsion - 1. experiments.** Petrovic, J.J.; Stout, M.G. (Los Alamos Natl Lab, NM, USA). *Journal of the American Ceramic Society;* **64**: No. 11, 656-660(Nov 1981).

The following conclusions can be drawn from the present investigation: (1) Combined tension/torsion tests on Al/sub 2/O/sub 3/ show that the tensile principal stress at fracture /sigma/sub //1 increases with increasing compressive principal stress /sigma/sub //2. Al/sub 2/O/sub 3/ is stronger in torsion than uniaxial tension, with combined tension/torsion strengths intermediate. (2) The tensile principal stress ratio is 1.31 for Al/sub 2/O/sub 3/. (3) Fracture investigations in the tension-compression quadrant of principal stress space indicate results dependent on the test method. Pressurized-tube studies generally indicate a weakening effect, whereas torsional investigations show strengthening. 17 refs.

2632 **Fracture of Al/sub 2/O/sub 3/ in combined tension/torsion - 2. Weibull theory.** Petrovic, J.J.; Stout, M.G. (Los Alamos Natl Lab, NM, USA). *Journal of the American Ceramic Society;* **64**: No. 11, 661-666(Nov 1981).

The Weibull statistical fracture theory for multiaxial stresses has been extended to conditions of combined tension/torsion loading. At fracture, a tensile principal stress ratio greater than one is predicted which is dependent on the stress state, Weibull modulus, and fracture location. Comparison to experimental tension/torsion data for Al/sub 2/O/sub 3/ shows that the Weibull theory, although predicting correct trends, generally underestimates strengthening effects of the compressive principal stress, thus providing a conservative failure prediction. This discrepancy may be related to influences of stress state on crack-tip "process zone" behavior. 30 refs.

2633 (INIS-mf—7127, pp 45) **Plasma sprayed zirconia coatings on graphite.** Barta, J. (Raphael, (Israel)); Shribman, V. (M.T.C. Carmiel (Israel)). [nd]. NTIS (US Sales Only), PC A04/MF A01.

From Workshop on plasma chemistry in technology; Ashkelon, Israel (30 Mar 1981).

3603 Composite Materials

REFER ALSO TO CITATION(S) 1783, 2750

2634 **(CONF-821049—2) Debonding of epoxy from glass in irradiated laminates.** Klabunde, C.E.; Coltman, R.R. Jr. (Oak Ridge National Lab., TN (USA)). 18 Oct 1982. Contract W-7405-ENG-26. 15p. NTIS, PC A02/MF A01. Order Number DE83001898.

From TMS/AIME fall meeting; St. Louis, MO, USA (24 Oct 1982).

Portions of document are illegible.

Glass-fabric-filled epoxies irradiated at 4.7 K and examined at room temperature by 20x stereomicroscopy showed an internal flaw structure which increasingly filled the sample as the γ-dose was increased. These flaws were determined to be areas where the plastic had debonded from the glass fibers. The extent of this process correlated well with the dose-dependent loss of mechanical strength. Evidence is reported for a similar mechanism in polyimides although visible flaws have not yet been produced. Possible mechanisms for debonding are suggested. New experiments are also suggested to clarify further the failure mechanism.

3604 Polymers And Plastics

REFER ALSO TO CITATION(S) 2666, 2686, 2755

3606 Other Materials

REFER ALSO TO CITATION(S) 1698, 1701, 1754, 1774, 1779, 1780, 1780, 1780, 1889, 1890, 1913, 1947, 1952, 1955, 1956, 1962, 1963, 1969, 2138, 2139, 2139, 2141, 2141, 2552, 2633, 2721, 2722

2635 **(AD-A—112977/4) The high temperature thermochemical properties of carbon. Interim report.** Baker, R.L.; Covington, M.A. (Aerospace Corp., El Segundo, CA (USA). Vehicle Engineering Div.). 31 Mar 1982. 97p. NTIS, PC A05/MF A01.

A new method based on the combined use of carbon laser ablation data and analytical modeling has been used to determine carbon vapor pressure and vaporization coefficients at high temperatures (up to 4600 deg K). The JANAF carbon species C3 thermochemical data have been rejected in favor of alternate data. The JANAF data predict a total vapor pressure too low by a factor of greater than two at 4000 deg K. The melt temperature of carbon has been concluded to be greater than 4500 deg K using a surface reflectivity method. The temperature dependence of vaporization coefficients for carbon species has been determined for the first time from 3300 to 4600 K.

2636 **(AD-A—113899/9) Cluster-type superconducting ternaries. Interim report 1 jan-31 dec 81.** Sienko, M.J. (Cornell Univ., Ithaca, NY (USA)). 7 Jan 1982. 9p. NTIS, PC A02/MF A01.

A new series of rare earth osmium-iridium tetraborides has been synthesized, characterized by X-ray diffraction, and studied for magnetic susceptibility over the range 1.8 to 1100 K. Several mixed Chevrel phase systems have been studied for superconductivity and crystallography as a function of replacement and nonstoichiometry.

2637 **(CONF-820945—5Draft) Coherent-precipitate formation in Tl-implanted Si.** Appleton, B.R.; Narayan, J.; White, C.W.; Williams, J.S.; Short, K.T. (Oak Ridge National Lab., TN (USA); Royal Melbourne Inst. of Tech. (Australia)). Sep 1982. Contract W-7405-ENG-26. 12p. NTIS, PC A02/MF A01. Order Number DE82022319.

From International conference on ion beam modification of materials; Grenoble, France (6 Sep 1982).

Ion scattering, ion channeling, and cross-section electron microscopy were used to investigate Si single crystals implanted with $^{205}Tl^{+}$ (0.29 - 1 x 10^{16} Tl/cm^2, 90 keV) and annealed with pulses (1.6 J/cm^2, 15 ns) from a ruby laser. Coherent precipitates of Tl were found to form as a result of laser processing. The systematics of the effect are presented and a formation mechanism proposed.

2638 **(DOE/ER/01198—1390) Low-temperature thermal expansion of amorphous solids.** Ackerman, D.A. (Illinois Univ., Urbana (USA). Materials Research Lab.). 1982. Contract AC02-76ER01198. 104p. NTIS, PC A06/MF A01. Order Number DE83001128.

Thesis.

For most amorphous materials at temperatures below $\simeq$ 1 K, the magnitudes and temperature dependences of specific heat, thermal conductivity and ultrasonic dispersion are qualitatively similar, independent of chemical composition. It has been suggested that thermal expansion also exhibits this universal behavior. The development of a dilatometer capable of resolving sample strains as small as 10^{-12} has permitted measurement of the linear thermal expansion of various glasses below 1 K. These investigations have demonstrated, however, that the low-temperature thermal expansion coefficient of glasses can be positive, negative, large or small. Analysis of measurements performed on two types of vitreous silica, two amorphous polymers, As_2S_3 and ZrO_2:Y_2O_3 is presented in the context of the phenomenological tunneling-states model. Consistency in explanation of thermal expansion and ultrasonic behavior is maintained by assuming a broad, weakly energy-dependent distribution of coupling strengths between phonons and the localized excitations thought to be characteristic of the glassy state.

2639 (INIS-SU—94, pp 84-85) **Impurities and radiation defects in complex alkaline earth fluorides.** Sibley, W.A. (Oklahoma State Univ., Stillwater (USA). Dept. of Physics). 1981. NTIS (US Sales Only), PC A23/MF A01.

From International conference on defects in insulating crystals; Riga-Salaspils, USSR (18 May 1981).

2640 (INIS-SU—94, pp 128-129) **Real structure of dielectric crystals at the level of point defects.** Distler, G.I. (AN SSSR, Moscow. Inst. Kristallografii). 1981. NTIS (US Sales Only), PC A23/MF A01.

From International conference on defects in insulating crystals; Riga-Salaspils, USSR (18 May 1981).

2641 (INIS-SU—94, pp 135-136) **Magnetic circular polarization of F center emission and the spin-mixing processes in optical pumping.** Ohkura, H.; Tara, K.; Akiyama, N.; Iwahana, K. (Osaka Univ., Toyonaka (Japan). Dept. of Physics); Imanaka, K. (Neuchatel Univ. (Switzerland). Inst. de Physique). 1981. NTIS (US Sales Only), PC A23/MF A01.

From International conference on defects in insulating crystals; Riga-Salaspils, USSR (18 May 1981).

2642 (INIS-SU—94, pp 142-143) **Optical and magneto-optical properties of F and F' centers in NaI and NaBr.** Baldacchini, G.; Gallerano, G.P. (Comitato Nazionale per l'Energia Nucleare, Frascati (Italy)); Grassano, U.M. (Rome Univ. (Italy). Ist. di Fisica); Luty, F. (Utah Univ., Salt Lake City (USA). Dept. of Physics). 1981. NTIS (US Sales Only), PC A23/MF A01.

From International conference on defects in insulating crystals; Riga-Salaspils, USSR (18 May 1981).

2643 (INIS-SU—94, pp 239-240) **Electromodulation optical spectroscopy of off-center impurity ions in crystals.** Krylov, V.A. (AN SSSR, Leningrad. Fiziko-Tekhnicheskij Inst.). 1981. NTIS (US Sales Only), PC A23/MF A01.

From International conference on defects in insulating crystals; Riga-Salaspils, USSR (18 May 1981).

2644 (INIS-SU—94, pp 308-309) **Effect of radiation defects on optical spectra of MgO:Ni.** Shironova, N.A.; Skvortsova, V.N.; Ulmanis, U.A. (AN Latvijskoj SSR, Riga. Inst. Fiziki). 1981. NTIS (US Sales Only), PC A23/MF A01.

From International conference on defects in insulating crystals; Riga-Salaspils, USSR (18 May 1981).

2645 (INIS-SU—94, pp 312-313) **Isoelectronic impurities as centers radiative recombination in wide band-gap oxides.** Valbis, J.A.; Lacis, I.E.; Rachko, Z.A.; Jansons, J.L.; Butlers, P.I. (Latvijskij Gosudarstvennyj Univ., Riga. Nauchno-Issledovatel'skij Inst. Fiziki Tverdogo Tela (USSR)). 1981. NTIS (US Sales Only), PC A23/MF A01.

From International conference on defects in insulating crystals; Riga-Salaspils, USSR (18 May 1981).

2646 (INIS-SU—94, pp 329) **F^{+}-centre in additively coloured and γ-irradiated monocrystals of yttrium-cluminium garnet.** Konstantinov, N.Yu.; Karaseva, L.G.; Gromov, V.V. (AN SSSR, Moscow. Inst. Fizicheskoj Khimii). 1981. NTIS (US Sales Only), PC A23/MF A01.

From International conference on defects in insulating crystals; Riga-Salaspils, USSR (18 May 1981).

2647 (INIS-SU—94, pp 345-346) **Vacancy centers in $Bi_{12}RO_{20}$(R=Si,Ti,Ge) single crystals.** Yeliseev, A.P.; Nadoliny, V.A. (AN SSSR, Novosibirsk. Inst. Neorganicheskoj Khimii:; Gusev, V.A. (AN SSSR, Novosibirsk. Inst. Avtomatiki i Ehlektrometrii). 1981. NTIS (US Sales Only), PC A23/MF A01.

From International conference on defects in insulating crystals; Riga-Salaspils, USSR (18 May 1981).

2648 (INIS-SU—94, pp 358-359) **Creation of defects in cathodochromic sodalites.** Denks, V.; Ruuns, T.; Denisov, R. (AN Ehstonskoj SSR, Tartu. Inst. Fiziki). 1981. NTIS (US Sales Only), PC A23/MF A01.

From International conference on defects in insulating crystals; Riga-Salaspils, USSR (18 May 1981).

2649 (INIS-SU—94, pp 370-371) **Ion-implanted ferroelectric ceramics for high-sensitivity photoferroelectric image storage.** Land, C.E.; Peercy, P.S. 1981. NTIS (US Sales Only), PC A23/MF A01.

From International conference on defects in insulating crystals; Riga-Salaspils, USSR (18 May 1981).

2650 (INIS-SU—94, pp 408-409) **Relaxation processes of free excitons in KBr:Na.** Toyoda, K. (Osaka City Univ. (Japan). Dept. of Physics); Nakamura, K.; Nakai, Y. (Kyoto Univ. (Japan). Dept. of Physics). 1981. NTIS (US Sales Only), PC A23/MF A01.

From International conference on defects in insulating crystals; Riga-Salaspils, USSR (18 May 1981).

2651 (INIS-SU—94, pp 478-479) **Interaction of defects and phonons with local vibrations in alkali halide crystals doped with molecular anions Tsub(d) and Csub(sv) symmetry.** Bely, M.U.; Boiko, V.V.; Kushnirenko, I.Ya.; Maksimovich, Ch.K. (Kievskij Gosudarstvennyj Univ. (Ukrainian SSR)). 1981. NTIS (US Sales Only), PC A23/MF A01.

From International conference on defects in insulating crystals; Riga-Salaspils, USSR (18 May 1981).

2652 (INIS-SU—94, pp 508-509) **Thermally stimulated depolarization of dipole complexes in crystals with fluorite structure.** Murin, I.V.; Murin, A.N. (Leningradskij Gosudarstvennyj Univ. (USSR)). 1981. NTIS (US Sales Only), PC A23/MF A01.

From International conference on defects in insulating crystals; Riga-Salaspils, USSR (18 May 1981).

2653 (LBL—14227) Two novel acceptors in ultra-pure germanium: nature and interconversion. Haller, E.E.; McMurray, R.E. Jr. (Lawrence Berkeley Lab., CA (USA)). Aug 1982. Contract AC03-76SF00098. 6p. (CONF-820875—1). NTIS, PC A02/MF A01. Order Number DE83000514.

From 12. international conference on defects in semiconductors; Amsterdam, Netherlands (31 Aug 1982).

Portions of document are illegible.

Experimental data on two shallow acceptors A_4 and $A_{3\ 5}$ in pure germanium are presented. The two acceptors appear with concentrations up to $\sim 10^{11}$ cm^{-3} always and only in ultra-pure germanium single crystals which have been grown in a pure N_2 ambient from a melt contained in a graphite crucible. The bound excited state spectra of both acceptors are hydrogenic. The ground state of A_4 is a $GAMMA_8$ quadruplet while the $A_{3\ 5}$ acceptor exhibits a ground state manifold consisting of at least two Kramers doublets, one with $GAMMA_6$ and the other with $GAMMA_7$ symmetry. The energy splitting between the two doublets is 1.1 MeV and it is symmetric in relation to the position of the A_4 ground state. Complete and reversible interconversion can be induced with appropriate thermal annealing. The experimental results suggest that A_4 and $A_{3\ 5}$ are two forms of one center. Above 700°K the A_4 concentration decreases irreversibly following an exponential decay. Interconversion can be observed at any point during the irreversible annealing of the center. 4 figures.

2654 (LBL—14580) Study of pore growth in glassy carbon using small angle x-ray scattering. Hoyt, J. (Lawrence Berkeley Lab., CA (USA)). Jul 1982. Contract AC03-76SF00098. 34p. NTIS, PC A03/MF A01. Order Number DE83001360.

Thesis.

Small-angle x-ray scattering was used to study the average pore size in glass-like carbon as a function of both heat-treatment time and heat-treatment temperature. A pore-growth model based on graphitization processes is presented. The simple mechanism shows that the change in the average radius of gyration with time is related to the total number of pores as a function of time, which in turn depends on the irreversible thermal-expansion phenomenon. The results of this study are inconsistent with a vacancy-migration pore-growth mechanism proposed earlier.

2655 (NP—2904733) Low-temperature behaviour of two-dimensional semiconductors (MOS-structures). Paulus, U. (Koeln Univ. (Germany, F.R.). Mathematisch-Naturwissenschaftliche Fakultaet). 7 Jun 1980. 38p. (In German). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82904733.

Thesis.

In this paper a simple two-band model is considered with interband - and intraband interactions. Compared with the more realistic six-band model of Kelly and Falicov this simple model has the advantage that the critical temperature for the CDW-transition, the collective modes, and the static conductivity can be calculated analytically in the framework of Hartree-Fock-approximation. A simplification of the model allows to formulate much more predictions, which presumably can be applied also to real systems. In the second part the model is described and the critical temperature is calculated in Hartree-Fock-approximation. Then the possible groundstates of the system are discussed. Transposition the model into the Ginzburg-Landau-formalism facilitates the connection with other studies. In the third part the low-energy collective excitations are determined. As is shown (in an approximation exceeding the Hartree-Fock-model) these excitations have the character of acoustic phonons; the 'velocity of sound' can be described as a function of temperature and coupling constant. In the last section the static electric conductivity is calculated within a simple approximation, and the behaviour at the phase transition is studied.

2656 (NRCN—505) Measurement of charge carrier lifetimes in HgCdTe crystals. Glaser, A. (Israel Atomic Energy Commission, Beersheba. Nuclear Research Center-Negev; Ben-Gurion Univ. of the Negev, Beersheba (Israel)). Dec 1981. 81p. (In Hebrew). NTIS (US Sales Only), PC A05/MF A01. Order Number DE82702993.

A method, developed for the determination of both electrical and photoelectrical properties of the same Hgsub(1-x)Cdsub(x)Te samples (around x=0.2), is presented. A system which includes a pulsed 0.9 μm wavelength GaAs light source was designed and constructed for the measurement of charge carrier lifetimes from 20 ns to 20 ms in temperature range 80-300 K. To find the mobility and concentration of the charge carriers, the Hall effect was determined via the van der Pauw method. Electrical and photoelectrical properties of raw material wafers could thus be established. Charge carrier lifetimes in Hgsub(1-x)Cdsub(x)Te, Ge and InSb were measured. The corresponding theoretical expected lifetimes were calculated on the basis of the charge carriers concentration. The experimental results are compared to the theoretical ones and the discrepancies are discussed.

2657 (SAND—82-1296C) MBE growth and characterization of InGaAs/GaAs strained-layer superlattices. Fritz, I.J.; Dawson, L.R.; Osbourn, G.C.; Gourley, P.L.; Biefeld, R.M. (Sandia National Labs., Albuquerque, NM (USA)). 1982. Contract AC04-76DP00789. 16p. (CONF-820960—3). NTIS, PC A02/MF A01. Order Number DE82022194.

From International symposium on GaAs and related compounds; Albuquerque, NM, USA (20 Sep 1982).

We have carried out the first investigation of the structural and electronic properties of MBE-grown In/sub x/Ga/sub 1-x/As/GaAs (100) strained-layer superlattices. These structures consist of alternating layers of In/sub x/Ga/sub 1-x/As ($x \simeq 0.2$) and GaAs in which the bulk lattice mismatch ($\simeq 1.4\%$) is totally accommodated by coherent strains. The layer thicknesses (in the range 30 to 100 A) and layer compositions were verified by x-ray diffraction. Photocurrent and photoluminescence spectroscopic measurements have been made to determine the position of the superlattice bandgap. The measured values are in good agreement with those predicted from theoretical calculations.

2658 (SAND—82-1297C) Optical properties of GaP/GaAs/sub x/P/sub 1-x/ strained-layer superlattices. Gourley, P.L.; Biefeld, R.M.; Osbourn, G.C.; Fritz, I.J.;. (Sandia National Labs., Albuquerque, NM (USA)). 1982. Contract AC04-76DP00789. 7p. (CONF-820960—4). D. Order Number DE83000316.

From International symposium on GaAs and related compounds; Albuquerque, NM, USA (20 Sep 1982).

Portions of document are illegible.

Using optical absorption, photocurrent spectroscopy, and photoluminescence, MOCVD-grown strained-layer superlattices composed of thin (100-300 A) alternating layers of lattice-mismatched (up to a few percent) GaP and to GaAs/sub x/P/sub 1-x/ with $x = 0.44$ and 0.26 are studied. For $x < 0.5$ these structures are expected to exhibit direct transitions due to zone folding, even though the individual layer materials both have indirect gaps. The observed energies and strengths of the SLS optical transitions are consistent with the zone center band structure predicted for these particular samples, although the absorption strength near the band edge is weakened due to spatial separation of electrons and holes.

2659 (SAND—82-1367C) Transient-capacitance studies of the pressure dependence of defect energy levels in Al/sub x/Ga/sub 1-x/As. Barnes, C.E.; Samara, G.A.; Dawson, L.R.; Zipperian, T.E. (Sandia National Labs., Albuquerque, NM (USA)). 1982. Contract AC04-76DP00789. 16p. (CONF-820960—2). NTIS, PC A02/MF A01. Order Number DE83000080.

From International symposium on GaAs and related compounds; Albuquerque, NM, USA (20 Sep 1982).

The pressure dependence of the energy levels associated with defects in III-V compounds can reveal valuable additional information about such centers. Using the technique of DLTS, we have studied the pressure dependence of defect energy levels in gamma irradiated LPE Al/sub x/Ga/sub 1-x/As p^+n junctions.

The results indicate that 4 out of 5 traps observed in AlGaAs are sensitive to pressure, and that their response to pressure is strongly valence-band like. Further, this type of pressure response is accentuated by increases in Al content.

2660 **(SAND—82-1959C) TEM study of the metamict state.** Headley, T.J.; Ewing, R.C.; Haaker, R.F. (Sandia National Labs., Albuquerque, NM (USA); New Mexico Univ., Albuquerque (USA). Dept. of Geology). 1982. Contract AC04-76DP00789. 11p. (CONF-820956—1). NTIS, PC A02/MF A01. Order Number DE82020984.

From 13. general meeting of the International Mineralogical Association; Varna, Bulgaria (19 Sep 1982).

The transformation from the crystalline to the metamict state is one in which a true structural change occurs in the material at the atomic level as a result of alpha-recoil events. Prior to reaching saturation doses, the material may consist of a mixture of crystalline and amorphous regions; however, the final saturation effect is one in which the electron diffraction patterns are broad, diffuse halos which are consistent with scattering from material with a nonperiodic atomic arrangement. To the limits of the resolution of the TEM (10-15 A, there was no evidence for long-range periodic structure or the formation of domain structures. Void formation accompanies the process of metamictization for complex, Nb-Ta-Ti oxides and zirconolite.

2661 **Semiconductor interface characterization in photoelectrochemical solar cells: the p-InP (111)A face.** Lewerenz, H.J.; Aspnes, D.E.; Miller, B.; Malm, D.L.; Heller, A. (Bell Labs., Murray Hill, NJ). *Journal of the American Chemical Society;* **104**: No. 12, 3325-3329(16 Jun 1982).

Spectroscopic ellipsometry and low-energy (helium) ion scattering spectroscopy show the formation of hydrated indium oxide on the (111)A (indium) face of p-InP when the crystal is etched in either air-saturated acid or methanol-bromine, or when used as photocathode in the p-semiconductor liquid junction solar cell. The stability and efficiency of the cell depend on the presence of a thin, large band gap layer of indium oxide. The relatively better performance of p-InP over p-GaAs in such a cell is attributed to the different oxide surface chemistry of the latter, which leads to contamination by elemental arsenic. The favorable performance of p-InP in the V(II)-V(III)-HCl cell is ascribed to the reduction of recombination sites in the forbidden gap by termination of the lattice by the oxide.

2662 **Radiation-enhanced saline leaching of silicate glasses.** Primak, W. (Argonne Natl Lab, Ill, USA). *Nuclear Science and Engineering;* **80**: No. 4, 689-699(Apr 1982).

A short ion bombardment greatly increases the hot saline etching or leaching of silicate glasses. Dran et al. described an effect that they found after a short ion bombardment with 200-kev lead ions: If the irradiated area were defined by an aperture, a depression of this area was found after placing the glass in a saline solution (concentration 250 g sodium chloride per liter of water) heated to 100/degree/C for 2 h. The purpose of this investigation was to confirm the effect reported by Dran et al. and to determine its cause. Refs.

2663 **Soft acoustic mode in thallium arsenic sulphide Tl/sub 3/AsS/sub 4/.** Fritz, I.J.; Gottlieb, M.; Isaacs, T.J.; Morosin, B. (Sandia Natl Lab, Albuquerque, NM, USA). *Journal of Physics and Chemistry of Solids;* **42**: No. 4, 269-273(1981).

Ultrasonic measurements of the slow shear mode velocity in Tl/sub 3/AsS/sub 4/ have been made as a function of hydrostatic pressure up to 2.6 GPa at room temperature. The velocity is a decreasing function of pressure over the entire pressure range. Two pressure-induced phase transitions are observed, one (at 2.1 GPa) characterized by a discontinuous drop in velocity, and the other (at 2.6 GPa) by a continuous softening of the velocity to zero. The results are discussed in terms of the Miller-Axe theory of internal-strain coupling to a soft optic mode. Comparison is made with results on Tl/sub 3/PSe/sub 4/, where only one transition is observed. 9 refs.

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2664 **(DOE/EV/05855—T1) Energy transformation in molecular electronic systems. Progress report, December 1, 1981-November 30, 1982.** Kasha, M. (Florida State Univ., Tallahassee (USA)). 1982. Contract AS05-78EV05855. 6p. NTIS, PC A02/MF A01. Order Number DE83000585.

Summaries are presented of studies on: molecular translational-rotovibronic Hamiltonians for nonlinear and linear molecules, singlet oxygen in potassium superoxide-water, proton-transfer spectroscopy of water in chromones, mechanism of 4-level molecular lasers, and cationic/anionic potential in proton-transfer spectroscopy. (DLC)

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REFER ALSO TO CITATION(S) 1563, 1581, 1656, 1657, 1683, 1693, 1708, 1804, 1811, 1814, 1818, 1819, 1826, 2081, 2693, 2901, 3004

2665 **(AD-A—113033/5) Electrochemistry of sulfur dioxide in nonaqueous solutions. Part I. Interim report.** Laughlin, L.S. (Naval Surface Weapons Center, Silver Spring, MD (USA)). 18 May 1981. 40p. NTIS, PC A03/MF A01.

A survey and discussion of published reports on the reduction of sulfur dioxide in nonaqueous solutions is presented as an introduction to the experimental plans and preliminary results contained in Part II.

2666 **(AD-A—114012/8) Ion beam methods for the surface characterization of polymers. Final report Jan-Jul 81.** Baun, W.L. (Air Force Wright Aeronautical Labs., Wright-Patterson AFB, OH (USA)). Feb 1982. 45p. NTIS, PC A03/MF A01.

Ion beam methods of surface characterization have not been applied extensively to polymers and other organic materials, but would appear to be very useful for these materials. Applications of high energy ion beam methods would seem to be limited except for specific cases but low energy methods such as ion scattering spectrometry (ISS) and secondary ion mass spectrometry (SIMS) should have numerous uses with polymeric materials. ISS is a true surface method which determines elemental composition at the first monolayer, but tells little about how the elements are combined. SIMS has high sensitivity for many elements, and has the capability of determining something of the molecular structure near the surface. Both ISS and SIMS, as well as high energy methods, give elemental composition with depth. These surface spectroscopies are useful in many areas of polymer technology including synthesis, extrusion and forming, and long time durability and stability under thermal and electromagnetic radiation.

2667 **(CONF-8110137—3) Rotating annular chromatograph for continuous metal separations and recovery.** Begovich, J.M.; Sisson, W.G. (Oak Ridge National Lab., TN (USA)). 1981. Contract W-7405-ENG-26. 12p. NTIS, PC A02/MF A01. Order Number DE83001928.

From Symposium on resource recovery and environmental issues of industrial solid wastes; Gatlinburg, TN, USA (28 Oct 1981).

Multicomponent liquid chromatographic separations have been achieved by using a slowly rotating annular bed of sorbent material. By continuously introducing the feed material to be separated at a stationary point at the top of the bed and eluent everywhere else around the annulus, elution chromatography occurs. The rotation of the sorbent bed causes the separated components to appear as helical bands, each of which has a characteristic, stationary exit point; hence, the separation process is truly continuous. The concept has been developed primarily on a 279-mm-diam by 0.6-m-long device with a 12.7-mm-wide annulus. The effect of annulus width and diameter has recently been studied using the same device with a 50.8-mm-wide annulus and another 0.6-m-long chromatograph with an 89-mm diameter and annulus widths of 6.4, 12.7, and 22.2 mm. These columns have been constructed of Plexiglas and typically operate at a gauge pressure of 175 kPa. To further

study the effect of size and pressure, a new 445-mm-diam by 1-m-long column with a 31.8-mm-wide annulus has been fabricated. Its metal construction allows preparative-scale operation with a wide variety of liquids at pressures to 1.3 MPa. Three metal recovery systems have been explored: (1) separation of iron and aluminum in ammonium sulfate-sulfuric acid solutions; (2) separation of hafnium from zirconium in sulfuric acid solutions; and (3) the separation of copper, nickel, and cobalt in ammonium carbonate solutions. This last system simulates the leach liquor of the Caron process for recovering nickel and cobalt from laterite ores. It has been studied, using similar conditions, on each of the chromatographs, and the results demonstrate the effect of column dimensions on the quality and quantity of the separation. 8 figures, 1 table.

2668 **(DOE/EV/10403—7) Use of fast-neutron activation analysis for the determination of the silicon content in coal, flyash, and soil.** Chan, K.K. (Illinois Univ., Urbana (USA). Coll. of Liberal Arts and Sciences). 1982. Contract AC02-80EV10403. 25p. NTIS, PC A02/MF A01. Order Number DE83001014.

Thesis.

The values of the silicon content and the associated precisions obtained for the samples analyzed in this study are listed. It was the purpose of this study to employ fast neutron activation analysis for the determination of silicon content in coal, flyash, and soil. The silicon content of coal, flyash, and soil samples have been obtained with accuracies and precisions in good agreement with the accuracies and precisions reported by other researchers performing similar analyses. Terramethylsilane was found to be a suitable standard for this study. Finally, careful sample packaging and handling techniques were found to be crucial for obtaining accurate and precise results. It can be concluded that fast neutron activation analysis using the system at the University of Illinois can be used successfully to determine silicon content.

2669 **(GKSS—81/E/30) Fast-neutron activation analysis with short-lived nuclides.** Fanger, H.U.; Pepelnik, R.; Michaelis, W. (GKSS-Forschungszentrum Geesthacht G.m.b.H., Geesthacht-Tesperhude (Germany, F.R.). Inst. fuer Physik). 1981. 17p. Dep. NTIS (US Sales Only), MF A01. Order Number DE82750198.

At the GKSS Research Center Geesthacht, a new 14 MeV activation facility - a 5 x 10^{12} n/s neutron generator combined with a fast rabbit system (KORONA) - is being installed. Homogeneous neutron flux at a level of 5 x 10^{10} n x cm^{-2} x s^{-1} and sample transfer times of 140 ms to a 16 m distant detector station are characteristic features of the facility described in the paper. With special consideration of short-lived nuclides and including cyclic activation, the analytical prospects with the intense neutron source are discussed, and sensitivities for 78 elements are presented.

2670 **(GKSS—81/E/31) 14 MeV neutron reactions producing gamma-ray emitting nuclides with half-lives below 3 seconds.** Pepelnik, R.; Fanger, H.U. (GKSS-Forschungszentrum Geesthacht G.m.b.H., Geesthacht-Tesperhude (Germany, F.R.). Inst. fuer Physik). 1981. 10p. Dep. NTIS (US Sales Only), MF A01. Order Number DE82750199.

Fast neutron activation analysis (FNAA) experiments were performed using a Cockroft-Walton neutron generator and a fast pneumatic rabbit system with a sample transport time of 120 ms. With this facility cyclic activations of ^{18}O, Zr, Pb leading to the short-lived reaction products ^{15}C, ^{90}sup(m)Zr, ^{138}sup(m)Ba and ^{207}Pb were investigated. From these measurements the analytical sensitivities of the involved reactions will be discussed.

2671 (Juel-Conf—44, pp 234-237) **Double plasma arc in a graphite tube - application of discharge atmospheres.** Arens, C.; Nickel, H.; Mazurkiewicz, M.; Vukanovic, D. Oct 1981. Dep. NTIS (US Sales Only).

From 5. German-Yugoslav meeting on materials science and development; Simmerath-Rurberg, F.R. Germany (6 Apr 1981).

With a view to safety and economic efficiency element-specific limits are required for permissible impurities in reactor graphite. This leads to the necessity of developing suitable methods of analysis. Emission spectroscopy has proved to be a method of analysis featuring a high detection capability and offering the possibility of determining several elements simultaneously. A prolongation of the particle residence time in the plasma (and, thus, an increase in radiation intensity) was the objective when developing a novel spectrochemical source of excitation. The method uses two d.c. arcs burning in a horizontally arranged graphite tube. The double plasma arc in a graphite tube has proved to be an excellent source of excitation for the analysis of powder and solutions.

2672 (Juel-Conf—44, pp 238-244) **Distribution of particle densities in a double plasma arc.** Simic, M.; Vukanovic, D.; Vukanovic, V.; Nickel, H.; Mazurkiewicz, M. Oct 1981. Dep. NTIS (US Sales Only).

From 5. German-Yugoslav meeting on materials science and development; Simmerath-Rurberg, F.R. Germany (6 Apr 1981).

In this work the distribution of particle densities in a double plasma arc developed for the direct analysis of solutions was investigated. The aim of these investigations was the explanation and determination of the optimum part of the plasma to be imaged, in order to achieve low detection limits. The subject of further investigations was to determine the time needed for the tube to reach a steady temperature and the arc to get stable burning conditions.

2673 **(KFK—3035) Development of an analytical procedure for plutonium in the concentration range of femtogram/gram and its application to environmental samples.** Schuettelkopf, H. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Hauptabteilung Sicherheit). Sep 1981. 158p. (In German). Dep. NTIS (US Sales Only), MF A01. Order Number DE82750200.

To study the behaviour of plutonium in the environment and to measure plutonium in the vicinity of nuclear facilities, a quick, sensitive analytical method is required which can be applied to all sample materials found in the environment. For a sediment contaminated with plutonium a boiling out method using first HNO_3/HF and subsequently HNO_3/$Al(NO_3)_3$ was found to be successful. The leaching solution was then extracted by TOPO and the plutonium back extracted by ascorbic acid/HCl. Some different purification steps and finally electroplating using ammonium oxalate led to an optimum sample for α- spectroscopic determination of plutonium. An analytical method was worked out for plutonium which can be applied to all materials found in the environment. The sample size is 100 g but it might also be much greater. The average chemical yield is 70 and 80%. The detection limit for soil samples is 0.1 fCi/g and for plant samples 0.5 fCi/g. One technician can perform eight analyses per working day. The analytical procedure was applied to a large number of environmental samples and the results of these analyses are indicated.

2674 **(ORNL/MIT—358) Settling velocities in batch sedimentation.** Fricke, A.M.; Thompson, B.E. (Massachusetts Inst. of Tech., Oak Ridge, TN (USA). School of Chemical Engineering Practice). Oct 1982. Contract W-7405-ENG-26. 69p. NTIS, PC A04/MF A01. Order Number DE83001681.

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The sedimentation of mixtures containing one and two sizes of spherical particles (44 and 62 μm in diameter) was studied. Radioactive tracing with ^{57}Co was used to measure the settling velocities. The ratio of the settling velocity U of uniformly sized particles to the velocity predicted to Stokes' law U_0 was correlated to an expression of the form $U/U_0 = \epsilon/\sup \alpha/$, where ϵ is the liquid volume fraction and α is an empirical constant, determined experimentally to be 4.85. No effect of viscosity on the ratio U/U_0 was observed as the viscosity of the liquid medium was varied from $1x10^{-3}$ to $5x10^{-3}$ Pa.s. The settling velocities of particles in a bimodal mixture were fit by the same correlation; the ratio U/U_0 was independent of the concentrations of different-sized particles.

2675 **(PB—82-196205) Gas generation systems for the evaluation of gas detecting devices. Final report.** Hughes, E.E.; Dorko, W.D.; Scheide, E.P.; Hall, L.C.; Beilby, A.L. (National Bureau of Standards, Washington, DC (USA)). Oct 1973. 113p. NTIS, PC A06/MFA01.

This report summarizes work concerned with the development of gas generation systems for use in verifying the performance

of gas detection devices or for the calibration of gas analysis instrumentation. The systems were designed to provide mixtures of a number of different gases and vapors in air at concentrations representing fixed proportions of the threshold limit value. Furthermore, they furnish a sufficient volume of gas to allow continuous testing of devices while maintaining a predetermined concentration level. The substances for which gas generation systems were developed are: carbon dioxide, carbon monoxide, ozone, sulfur dioxide, hydrogen sulfide, nitrogen dioxide, benzene, carbon tetrachloride, trichloroethylene, ammonia, and chlorine. The systems are of 4 basic types: direct delivery from cylinders of known concentration. Dynamic blending of high concentrations with air, permeation tubes, and generation of the substance directly in an air stream. Monitoring systems are suggested to allow confirmation of the quantities generated. Details of construction are given.

2676 **Preparation of lunar sample and meteorite mock-ups: Or how to make rocks.** Edwards, D.R.; Reeves, J.H.; Brodzinski, R.L. (Battelle Pacific Northwest Labs., Richland, WA (USA)). *Nuclear Instruments and Methods in Physics Research;* **196**: No. 2-3, 507-509(15 May 1982).

In order to accurately determine the cosmogenic and primordial radionuclide concentrations in meteorites and lunar samples, it is necessary to prepare mock-ups containing known concentrations of the radioisotopes of interest. This paper describes a technique for preparing such mock-ups containing known concentrations of homogeneously distributed radionuclides within a matrix having the same gamma-ray attenuation characteristics as the original rock. The procedure can be modified to reproduce other elemental or physical characteristics as required.

2677 **Detailed solvation shell geometry of cupric ion in ethanol determined by electron-spin-echo modulation analysis.** Ichikawa, T. (Hokkaido Univ., Sapporo, Japan); Kevan, L. *Journal of the American Chemical Society;* **104**: No. 6, 1481-1483(1982).

The analysis of electron-spin-echo modulation patterns for Cu^{2+} in variously deuterated ethanol glasses shows that Cu^{2+} is solvated by six approximately equivalent ethanol molecules with their molecular dipoles oriented toward Cu^{2+}. A distance of >0.03 nm between in-plane and out-of-plane molecules should be distinguishable in this analysis, so a single shell analysis is a good approximation. From specific deuteration studies the average orientation of a first solvation shell ethanol molecule with respect to Cu^{2+} is deduced. The distance from Cu^{2+} to the ethanol oxygen is 0.21 nm, that to the hydroxyl proton is 0.26 nm, those to the methylene protons are 0.35 and 0.41 nm, and those to the methyl protons are 0.38, 0.49, and 0.49 nm. The HOC plane is perpendicular to the OCC plane in ethanol, giving a molecular conformation intermediate to the trans and gauche forms.

2678 **Taming a mode-locked laser.** Maddux, A.S.; Haugen, G.B. (Univ. of California, Livermore). *Analytical Chemistry;* **52**: 780-783(1980). Contract W-7405-ENG-48.

In the past few years an increasing effort has been made to incorporate lasers into analytical spectroscopy with the expectations of expanding existing analytical capabilities and of evolving new applications based on the unique characteristics of the laser. In particular, the pulses generated by a mode-locked laser make accessible the spectroscopic investigation of ultrafast physical and chemical processes. The primary interest of an investigator is in the processes themselves, not in the excitation source used to probe the system. Thus the excitation source should require minimal operator attention. The opposite is the case for a mode-locked driver using a simple radiofrequency (rf) oscillator; the mode-locking system demands a considerable share of the investigator's time. Unfortunately, this distracts somewhat from the usefulness of the laser as an analytical implement. The state of the art in driver design uses the concept of frequency synthesizers, which greatly improves the reliability of driver operation. Nevertheless, the earlier design is still in use in many laboratories, and an improvement in the reliability of operation would be much desired. To this end, we describe in this report an acousto-optic mode-locked laser system that requires minimal adjustment after the initial setup is in place.

4002 Inorganic And Physical Chemistry

REFER ALSO TO CITATION(S) 1643, 1841, 1847, 2139, 2677, 2688

2679 **(AD-A—112029/4) Vibrational and rotational energy transfer in highly vibrationally excited hydrogen fluoride and deuterium fluoride. Summary report jun 81-may 82.** Crim, F.F. (Wisconsin Univ., Madison (USA). Dept. of Chemistry). 1 Mar 1982. 6p. NTIS, PC A02/MF A01.

Combining the techniques of direct excitation of overtone vibrations and time resolved spectroscopic detection permits detailed measurements of the vibrational and rotational relaxation of highly vibrationally excited molecules. Using this technique, we have measured vibrational and rotational relaxation in HF($v = 3,4,5$) between 300 K and 650 K and have compared these results to various theoretical calculations. Using laser double resonance to probe individual rotational states, we find phenomenological rotational relaxation rate constants which decrease montonically with rotational energy change in the vibrationally excited molecule, and we have directly measured the vibrational relaxation rate constants for $v = 1$ and $v = 2$ as well as made a preliminary estimate of the (surprisingly small) fraction of the relaxation which goes by vibration-to-vibration energy transfer.

2680 **(DOE/ER/04987—3) Solid-state, surface, and catalytic properties of oxides. Progress report, September 1, 1981-September 30, 1982.** Kung, H.H. (Northwestern Univ., Evanston, IL (USA). Dept. of Chemical Engineering). Oct 1982. Contract AC02-78ER04987. 10p. NTIS, PC A02/MF A01. Order Number DE83001368.

In spite of the importance of many transition metal oxide catalysts in industrial processes such as methanol synthesis, carbonylation, water-gas shift, dehydrogenation, and selective oxidations, fundamental understanding of the surface chemistry and their relationship with catalysis on oxides is far less well established than metal catalysts. For example, catalytic importance of surface defects such as steps and kinks has yet to be demonstrated with oxides. Similarly structure sensitivity has to be demonstrated. Strong catalyst-support interaction has been found, but careful classification is in need. It is the goal of this research to enhance the understanding of oxide catalysis through the search for the underlying chemical principles that govern the surface chemistry of the systems involved. Our emphasis in this period has been along these directions. First the stability and surface chemical properties of stepped zinc oxide crystal surfaces were carefully investigated. Second, the reaction of surface adsorbed oxygen with butene and butadiene on iron oxide was studied. Third, theoretical analysis on the formation of new acidic sites in mixed oxides has been performed. Significant progress in these studies are described.

2681 **(DOE/ER/04991—4) ESR studies of surface adsorption and catalysis under ultra-high vacuum conditions. Progress report, March 1, 1982-February 28, 1983.** Freed, J.H. (Cornell Univ., Ithaca, NY (USA). Dept. of Chemistry). Sep 1982. Contract AC02-78ER04991. 80p. (COO—4991-4). NTIS, PC A05/MF A01. Order Number DE83000995.

A study was conducted of the new phenomenon of surface-suppressed ESR (SSESR), in which stable paramagnetic radicals adsorbed on clean Ag or Cu surfaces have their ESR signal suppressed until several layers of molecules insulate subsequent layers from the metal surface. This study combined UHV-ESR, CREMSEE, and thermal desorption. A tentative model based upon transmission of the effects of the surface conduction band of the metal by the weak exchange forces between the paramagnetic species was suggested. Experiments on a model system by means of Laser Time Resolved ESE spectroscopy were performed. A photo-induced transient electron was produced from Rb ions in nonpolar medium. The spin relaxation of the transient electron was studied vs temperature and alkali metal concentration. The transient electron is initially spin-polarized, and the degree of spin-polarization is affected by the wavelength. Such an effect would be expected from a long-lived geminate radical-pair mechanism ($Rb^+ + e^-$) causing the spin-polarization, with the initial separation distance affected by the energy of the photon absorbed. An extended Hueckel MO analysis

of our previous O_2^-/Ti-vycor study was completed; a new and improved photo-CREMSEE apparatus was completed and utilized; motional dynamics of NO_2 on zeolites was analyzed; and work was conducted on a photo-induced source of H atoms for Laser Time Resolved ESE experiments were carried out.

2682 **(Juel-Spez—101) Determination of atmospheric partial pressure from gas-containing evaporites.** Wuttke, G. (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Inst. fuer Chemie). Mar 1981. 68p. (In German). NTIS (US Sales Only), PC A04/MF A01. Order Number DE82902951.

A determination is made of the quantitative relationship between gases contained in evaporites and partial pressure which are predominant in the building of salts, by which means of two simulation experiments that employ NaCl and KCl crystals. 44 references, 14 figures, 8 tables.

2683 **(LBL—14625) Dynamic nuclear-polarization studies of paramagnetic species in solution.** Glad, W.E. (Lawrence Berkeley Lab., CA (USA)). Jul 1982. Contract AC03-76SF00098. 146p. NTIS, PC A07/MF A01. Order Number DE83001533.

Thesis.

Dynamic Nuclear Polarization (DNP) was used to measure the electron spin lattice relaxation times, T_1, of transition metal ions in aqueous solution. Saturation which is induced in the electron spin system is transferred to the solvent proton spins by dipole-dipole interactions. The change in the polarization of the proton spins is much larger than it is in the electron spins. The change in proton polarization is easily measured by proton Nuclear Magnetic Resonance (NMR). In one experimental arrangement the sample solution was continuously flowed through a microwave cavity to the NMR coil. The NMR was observed with a continuous wave NMR spectrometer. In a second arrangement the whole sample tube was moved from within the microwave cavity to the NMR coil in less than 40 ms by a blast of compressed air. The NMR was then observed with a pulse-Fourier-transform spectrometer. With the second arrangement a mean-square microwave magnetic field at the sample of more than 10 G^2 is obtainable with 14 W of microwave power. Measurements of DNP at 9 GHz were made on aqueous solutions of VO^{2+}, Mn^{2+}, $Cr(CN)_6^{3-}$, Cu^{2+} and Cu(ethylenediamine)$_2(H_2O)_2^{2+}$ ions from 3 to 60°C. It was also possible to observe DNP on resolved proton resonances from mixed water-acetonitrile solutions of VO^{2+} and $Cr(CN)_6^{3-}$ ions.

2684 **Energetics and mechanisms for reactions involving nitrosamide, hydroxydiazenes, and diimide n-oxides.** Casewit, C.J.; Goddard, W.A. III. (California Inst. of Tech., Pasadena). *Journal of the American Chemical Society;* **104**: No. 12, 3280-3287(16 Jun 1982). Contract AM03-76SF00767.

Using ab initio techniques, the geometries and energies of nine isomers of N_2H_2O including hydroxy-1,1- and hydroxy-1,2-diazenes (e.g., HN==NOH), nitrosamide (H_2N-NO), and diimide N-oxides (HN=N(→O)H) have been solved. The heats of formation obtained from these calculations are used to examine several chemical processes including (i) the reaction $H_2N + NO \rightarrow N_2 + H_2O$, postulated to be a key step in the thermal DeNO/sub x/ process for reducing NO to N_2 in stationary power plants, (ii) deoxygenation of N-nitroso compounds and azoxy compounds, and (iii) nitrosation of amines.

2685 **Preparation and crystal structure of bis[bis(pentamethylcyclopentadienyl)ytterbium(III)] undecacarbonyltriferrate, $[C_5Me_5)_2Yb]_2[Fe_3(CO)_{11}]$: A compound with four isocarbonyl (Fe-CO-Yb) interactions.** Tilley, T.D.; Anderson, R.A. (Univ. of California, Berkeley). *Journal of the American Chemical Society;* **104**: No. 6, 1772-1774(1982). Contract W-7405-ENG-48.

It has been shown recently that the divalent lanthanide complex $(C_5Me_5)_2Yb(OEt_2)$ reduces $CO_2(CO)_8$, cleaving the metal-metal bond to give a complex where the tetracarbonylcobaltate anion is bonded to the trivalent Lewis acid fragment $[Yb(C_5Me_5)_2(THF)]^+$ by donation of a lone pair of electrons on one of the carbon monoxide groups. Infrared and X-ray data suggest that the carbon-oxygen bond of the bridging carbonyl ligand was significantly weakened, resulting in a charge disparity in the sense Co(δ-)-Yb(δ+). This should enhance the reactivity of the bridging carbon monoxide group toward nucleophilic and/or electrophilic reagents. Such carbon- and oxygen-bonded carbonyl ligands have been shown to ehibit unique physical properties and reactivity. In the investigation of the utility of $(C_5Me_5)_2Yb(OEt_2)$ in preparing complexes of transition-metal carbonyl anions that contain clusters having bridging carbon monoxide groups. Carbonyl ligands that bridge two or more transition metals have a lower-C-O bond order than terminal ones and are better σ donors toward hard Lewis acids. As a result, some Lewis acids induce terminal-to-bridge CO shifts. Such interactions will result in further charge disparity in the bridging carbon monoxide group and activate the C-O bond to an even greater extent.

4003 Organic Chemistry

REFER ALSO TO CITATION(S) 1655, 1781

2686 **(DOE/ER/05462—T1) Synthesis of new functionalized fluorocarbon polymers for use as battery separators and membranes. Final report.** (Texas Univ., Austin (USA). Dept. of Chemistry). 1 Sep 1979. Contract AS05-77ER05462. 8p. NTIS, PC A02/MF A01. Order Number DE83001652.

Three main synthetic routes were used: oxyfluorination of branched polymers such as poly-4-methylpentene, hydrolysis of perfluorinated pendant polyesters, and direct fluorination of polyester and anhydride hydrocarbon. All 3 routes have been highly successful. Film-forming polymer mixtures have been designed which permit independent control of the cross-link density and the concentration of ionizable groups. (DLC)

2687 **(DOE/ER/10661—T1) Combustion of model fuels with low hydrogen content. Progress report, October 1, 1981-September 30, 1982.** (Cornell Univ., Ithaca, NY (USA)). 1982. Contract AC02-80ER10661. 7p. NTIS, PC A02/MF A01. Order Number DE83001548.

The products generated by shock heating benzene, naphthalene, biphenyl and biphenylene are generally similar, yet they differ quantitatively, and these differences are temperature dependent. At this stage, we are still at the beginning of the data reduction process, particularly with reference to an analysis of their respective sooting behavior.

2688 **Metal alkoxides: models for metal oxides. 2. Addition of ethyne, propyne, and 2-butyne to $Mo_2(OR)_6$ (M triple bond M) compounds (R = t-Bu, i-Pr, and Ne). Characterization of μ-alkyne and μ-C_4H_4 adducts and an evaluation of their role in alkyne oligomerization reactions.** Chisholm, M.H.; Folting, K.; Huffman, J.C.; Rothwell, I.P. (Indiana Univ., Bloomington). *Journal of the American Chemical Society;* **104**: No. 16, 4389-4399(11 Aug 1982).

Rapid reactions of hydrocarbon solutions of $Mo_2(OR)_6$(M triple bond M) compounds where R=t-Bu, i-Pr, and CH_2CMe_3 with the alkynes C_2H_2, MeC_2H, and MeC_2Me are reported. The μ-acetylene and μ-C_4H_4 adducts formed with the reaction products in the presence of pyridine have been isolated and characterized. X-ray diffraction and NMR studies of the adducts are reported. (BLM)

2689 **Reactions of aliphatic radicals with benzylaquocobaloxime: kinetics of coupling reactions as studied by novel kinetic competition methods.** McHatton, R.C.; Espenson, J.H.; Bakac, A. (Iowa State Univ., Ames). *Journal of the American Chemical Society;* **104**: No. 12, 3531-3533(16 Jun 1982). Contract W-7405-ENG-82.

Reactions of aliphatic radicals with benzylcobaloximes were found to be similar to those previously postulated for the catalytic reactions of selected organocobaloximes with tetrahalomethanes and arenesulfonyl chlorides. Data indicated that these reactions were biomolecular reactions, and their rate constants were determined with new methods of chemical competition. Although homolytic displacement has been considered the descriptive phrase for

the reactions, it is pointed out that a mechanism consisting of radical addition and reductive elimination also agrees with the experimental results. (BLM)

2690 **Chemistry of cyclic olefins and polyenes on nickel and platinum surfaces.** Tsai, M.C.; Stein, J.; Friend, C.M.; Muetterties, E.L. (Univ. of California, Berkeley). *Journal of the American Chemical Society;* **104**: No. 12, 3533-3534(16 Jun 1982). Contract AC03-76SF00098.

Results of ultrahigh vacuum studies of C_4-C_8 cyclic olefins and polyene chemisorption on Ni and Pt surfaces are presented. A mechanism is proposed for the novel surface mediated conversions of cycloheptatriene and norbornadiene to benzene. Studies of adsorption and thermal desorption of norbornadiene-7-d_1 on Pt(111) and Pt(100) indicated that there is no deuterium in the benzene produced on Pt(111), but that produced on Pt(100) contained ~ 15 to 20% C_6H_5D. An exchange process between C_6H_6 and D atoms on Pt(100) has been established but not for Pt(111). (BLM)

4004 Electrochemistry

REFER ALSO TO CITATION(S) 2363

4005 Photochemistry

REFER ALSO TO CITATION(S) 1959, 2681

2691 **(DOE/ER/02026—42) Studies in chemical reactivity. Progress report, 30 November 1981 to 1 October 1982.** Carr, R.W. Jr. (Minnesota Univ., Minneapolis (USA). Dept. of Chemical Engineering and Materials Science). 1982. Contract AC02-76ER02026. 13p. NTIS, PC A02/MF A01. Order Number DE83001646.

Progress reports are presented for the following research topics: reaction of chlorofluoromethyl radicals, CF_2Cl, with O_2; kinetics of highly vibrational excited molecules; kinetics of $CH_2(^1B_1)$ reactions; and flash photolysis with time resolved mass spectroscopy. Some of the highlights are: (1) information on the mechanism of the reaction of CF_2Cl radicals has been obtained, including evidence that CF_2ClO radicals can oxidize CO; (2) CF_2Cl radicals were produced by photooxidation of 1,3-dichlorotetrafluoroacetone (DTA) at 313 nm; (3) investigation of the DTA-O_2 photolysis system using flash spectroscopy continued and observations are summarized; (4) results from laser flash photolysis-absorption spectroscopy show that collisional deactivation of toluene, ethylcycloheptatriene and isopropylcycloheptatriene occurs by removal of relatively small amounts of energy; (5) flashlamp pumped dye laser was used as a 400 nm excitation source to photolyze diazomethane, CH_2N_2. The photon energy was sufficient to produce the second excited state of methylene, $CH_2(^1B_1)$. (ATT)

2692 **(EUR—7793-EN) Study of primary and associated reactions in photosynthesis. Final report.** Duysens, L.N.M.; van Grondelle, R.; Pulles, M.P.J. (Rijksuniversiteit Leiden (Netherlands)). 1982. 153p. European Community Information Service, 2100 M Street NW, Suite 707, Washington, DC 20037.

The object of this research is to characterize the primary photophysical and photochemical processes which occur in photosynthesis, to obtain insight into the mechanisms, which as now has become clear initially store the light energy via an excited chlorophyll molecule into a pair of separated charges, and to understand how the effects of the unavoidable back reactions are minimized. During the period of the contract (1976 to 1979) work has concentrated on the study of the primary and associated reaction by means of partly novel biophysical techniques. Three lines of approach can be distinguished, which are discussed successively: (1) Studies of the emission yield of (bacterio)chlorophyll as a function of various parameters such as temperature and magnetic field intensity, as monitors of various primary and associated reactions; (2) energy transfer in the pigment systems; and (3) electron transport at the donor side of system 2, using chlorophyll a fluorescence as a monitor for the reduction of the oxidized primary acceptor $P680^+$.

4006 Radiation Chemistry

REFER ALSO TO CITATION(S) 2677

2693 **(ORNL-tr—4879) Research on the effect of salts of uranium, zirconium, and ruthenium on radiolysis of the tributyl phosphate-dodecane-HNO_3 systems.** Novak, Z.; Novak, M.; Zaydel, A. (Oak Ridge National Lab., TN (USA)). [nd]. Contract W-7405-ENG-26. Translation of INIS-mf-5564, pp 8-13, 1977. 12p. NTIS, PC A02/MF A01. Order Number DE83000004.

The possibility of precisely determining the changes in the properties of the extraction system which occur when exposed to ionizing radiation, as well as the effect of various factors upon the process of degradation, are extremely significant not only from the point of view of disturbance of the extraction processes, but also because of the corresponding implementation of regeneration of the extractant. The studies showed that salts under study have a slight effect on the process of radiation nitration of the TBP-dodecane system. However, they increase the release of carbonyl compounds, in particular those which are formed in successive effects. The presence of salts in the system also increases the radiation release of acids and esters. The quantity of uranium and zirconium increases relatively little in the organic phase upon re-extraction in the systems which were irradiated with uranyl nitrate, zirconyl nitrate and nitrosyl ruthenium, in comparison with systems which were irradiated without these salts. It was noted as well that in the systems which contained zirconium nitrate, the quantity of solidly bound uranium and zirconium decreases in the radioactively degraded organic phase. In summing up the research conducted, it can be concluded that the process of radiolysis is affected rather significantly by the presence of uranium salts which increase the quantity of the degradation products of extractant and diluent which are obtained, while a small quantity of salts of zirconium and ruthenium has only a slight effect on the radiolysis of the systems under study. 4 tables.

2694 **(DOE/ER/03435—1) Microwave-optical double resonance spectroscopy. Final report, February 1, 1971-October 31, 1980.** Pratt, D.W. (Pittsburgh Univ., PA (USA). Dept. of Chemistry). 1 Sep 1982. Contract AC02-76ER03435. 32p. (COO—3435-35). NTIS, PC A03/MF A01. Order Number DE83000232.

Optical, zero-field and high-field optical detection of magnetic resonance, electron-nuclear double resonance, level anticrossing and cross relaxation, and electron paramagnetic resonance experiments have been performed on a variety of chemical systems in order to further basic knowledge of the structure, reactivity, and response to radiation of molecules in their ground and/or excited electronic states. Systems investigated include organic molecules oriented in low temperature crystals, simple free radicals, transition metal complexes, rare earth hydrides, and hemeproteins in biological enzymes. Many of these systems are of potential importance in a number of applied areas including hydrocarbon-based fuel systems, solar energy devices, laser-initiated photochemical reactions, and free radical mechanisms in chemical carcinogenesis.

2695 **(INIS-mf—6998) Charged species in dielectric liquids generated by high energy radiation.** van der Ende C.A.M. (Rijksuniversiteit Leiden (Netherlands)). 30 Sep 1981. 108p. NTIS (US Sales Only), PC A06/MF A01. Order Number DE82780754.

Thesis.

The main subject of Part I of this thesis is the investigation of the kinetics of the geminate recombination of the charged species, in relation to the yield of scavenging of the charged species and the initial spatial distribution. The geminate charge recombination kinetics in cyclohexane is investigated and the relation with the charge scavenging is considered. The geminate ion kinetics in liquid CCl_4 is considered and the scavenging of excess electrons by CH_3Br in cyclohexane, n-hexane and isooctane is treated in some detail. From the measurements of the microwave absorption the product of the yield and mobilities of the charged species is obtained. Provided the geminate kinetics is known it is possible to determine the mobility and the reactivity towards solutes of the charged species from measurements on a time scale on which the

geminate recombination takes place. This is of importance when the charged species under investigation is short lived (e.g. because of reaction with impurities). In this way the mobility and reactivity of the negative species in liquid hexafluorobenzene could be studied. While C_6F_6 efficiently captures electrons in the gas phase as well as in hydrocarbon liquids, in pure liquid C_6F_6 efficient migration of the negative charge takes place. The study of the nature of this phenomenon is the subject of Part II.

2696 (INIS-SU—94, pp 50-51) **Radiolysis in rare gas crystals.** Balzer, R. (Technische Hochschule Darmstadt (Germany, F.R.)). 1981. NTIS (US Sales Only), PC A23/MF A01.

From International conference on defects in insulating crystals; Riga-Salaspils, USSR (18 May 1981).

2697 (INIS-SU—94, pp 54-55) **Precipitation of metal colloids in irradiated ionic crystals.** Chassagne, G. (Lyon-1 Univ., 69 (France)). 1981. NTIS (US Sales Only), PC A23/MF A01.

From International conference on defects in insulating crystals; Riga-Salaspils, USSR (18 May 1981).

2698 (INIS-SU—94, pp 404-405) **Relaxation and decay of excitons in LiH and LiO crystals.** Plekhanov, V.G.; O'Connel-Bronin, A.A.; Pustovarov, V.A.; Cholakh, S.O.; Gavrilov, F.F. (AN Ehstonskoj SSR, Tartu. Inst. Fiziki). 1981. NTIS (US Sales Only), PC A23/MF A01.

From International conference on defects in insulating crystals; Riga-Salaspils, USSR (18 May 1981).

2699 **Bibliographies on radiation chemistry. 6. Patents on irradiation cross linking of polymers.** Baird, W.G. Jr.; Joonase, P. (Grace (W.R.) and Co., Duncan, SC (USA). Cryovac Div.); Rose, A.B.; Helman, W.P. (Notre Dame Univ., IN (USA). Radiation Lab.). *Radiation Physics and Chemistry;* **19**: No. 5, 339-360(1982).

Changes of polymer physical and chemical properties by means of electron beam and gamma irradiation cross linking are utilized to manufacture a wide variety of products. It has become a multi-million dollar worldwide business. Intensive research and development in this field has resulted in the granting of hundreds of patents in the United States and abroad. These patents contain valuable information on the irradiation processing of a wide variety of polymers for use in the manufacture of packaging materials, foams, electrical wire and cable insulation, wood polymer composites, and many other important commercial products. This bibliography lists over 500 patents related to radiation cross linking of polymers which have been compiled from Radiation Chemistry Data Center files, augmented by the resources of Cryovac Div., W.R. Grace and Co. The list includes patents collected through about mid-1981. The bibliography has been restricted, in general, to exclude radiation curing (e.g. hardening of coatings), production of cross linkable resins, and patents covering polymeric products which have been cross linked. The patents are arranged by year in approximate chronological order. Title, author(s) and assignee, and reference to an abstract, are given in most entries.

2700 **Van der Waals molecules -linking the gas and liquid phases.** Klots, C.E. (Oak Ridge National Lab., TN (USA)). *Radiation Physics and Chemistry;* **20**: No. 1, 51-56(1982).

The mass spectrometry of van der Waals molecules can shed light on the interfacing of radiation chemistry in the gaseous and condensed phase. We illustrate this with a potpourri of published and hitherto unpublished results.

4007 Radiochemistry And Nuclear Chemistry

REFER ALSO TO CITATION(S) 1707, 1829, 2934, 2935, 2936, 3074

2701 (AD-A—113462/6) **CBR contamination/decontamination phase of development testing. Final report on test operations procedure.** (Army Test and Evaluation Command, Aberdeen Proving Ground, MD (USA)). 30 Apr 1981. 28p. NTIS, PC A03/MF A01.

This Test Operations Procedure provides methods for assessing an item's suitability for use in a CBR environment. Suitability is established by determining if the item can be satisfactorily decontaminated in the field and by determining the effect of CBR contamination/decontamination on the item's physical and performance characteristics. The procedures are not designed for performance testing of CBR protective items.

2702 (DOE/ER/01713—110) **Reaction studies of hot silicon and germanium radicals. Progress report, September 1, 1981-September 30, 1982.** Gaspar, P.P. (Washington Univ., St. Louis, MO (USA)). 30 Sep 1982. Contract AC02-76ER01713. 9p. (COO—1713-110). NTIS, PC A02/MF A01. Order Number DE83000992.

Portions of document are illegible.

Progress in two areas important to attaining the goals of this research program are briefly reviewed: (a) characterization of the major product-forming intermediate in the reactions of recoiling silicon atoms; (b) time-resolved laser flash spectroscopic studies of the generation and reactions of silicon radicals. 1 figure.

2703 **Rapid radiochemical separation procedure for mercury from lead and bismuth targets.** Mirzadeh, S.; Chu, Y.Y. (Brookhaven National Lab., Upton, NY (USA)). *Radiochemical and Radioanalytical Letters;* **51**: No. 5, 279-284(16 Apr 1982).

A rapid radiochemical procedure has been developed for the isolation of short-lived sup(205-207)Hg from lead and bismuth targets. The average chemical yield obtained was 53+-5% and the separation was completed in less than 5 min. Decontamination factors of $>10^5$ from Bi, Pb and Tl were achieved. The mercury activities obtained were used to measure the effective cross sections of the following reactions with 30-160 MeV neutrons: ^{206}Pb(n,2pxn)sup(207-x)Hg, and ^{209}Bi(n,3pxn)sup(207-x)Hg, for x=0,1, and 2.

4008 Combustion, Pyrolysis, And High-temperature Chemistry

REFER ALSO TO CITATION(S) 1848, 2687, 3157

2704 (UCRL—88180) **Flame inhibition by CF_3Br.** Westbrook, C.K. (Lawrence Livermore National Lab., CA (USA)). Sep 1982. Contract W-7405-ENG-48. 47p. (CONF-821035—4). NTIS, PC A03/MF A01. Order Number DE83000695.

From Combustion Insitute symposium on western states section; Livermore, CA, USA (11 Oct 1982).

A numerical model is used to investigate the properties of laminar flames inhibited by CF_3Br. Fuels include hydrogen, methane, methanol, and ethylene, with both oxygen and air as the oxidizers. A detailed chemical kinetic reaction mechanism for the fuel oxidation is combined with a mechanism describing reactions of CF_3Br and its halogenated products. The effects of CF_3Br on the flammability limits and burning velocity of laminar flames are predicted by the model, and the effects of variations in pressure, unburned gas temperature, and equivalence ratio on inhibition efficiency are examined. 4 figures, 4 tables.

42 ENGINEERING

4202 Facilities And Equipment

REFER ALSO TO CITATION(S) 1601, 1603, 1605, 2060, 2583, 2788, 2804,

2835, 2844, 2852, 2913, 2986, 3836

2705 (AD-A—113660/5) Continued development of a 10 K cryogenic cooler. Final technical report 1 Jun-31 Dec 81. Newman, W. (Philips Labs., Briarcliff Manor, NY (USA)). Mar 1982. 36p. NTIS, PC A03/MF A01.

Development of the design selected for the 10 degree K cryogenic cooler in the Phase I study was continued in this second phase of the program. The configuration arrived at in Phase 1 was a triple-expansion, free-displacer Stirling-cycle refrigerator driven by a linear motor. Vibrations are attenuated with a passive vibration absorber. Electromagnetic noise from the motor is attenuated with layered, high permeability, magnetic shielding. The cooler can meet or better the goals for cooling and power consumption. It can provide 200 mW of cold at 10 degrees K at the maximum allowable input of 250 W, or provide the prescribed 50 mW of cold with less than 100 W of input power. The cooler weight is 35.9 kg for the thermodynamic components, 17 kg for the vibration absorber, and 8.6 kg for the EMI shielding. The design goals for cooldown time and regulation of the cold-tip temperature can be met or bettered. The resulting EMI and vibration levels can not be accurately predicted, but they are expected to exceed the extremely low levels desired.

2706 (AD-A—114056/5) Stability measurements of aluminum-stabilized NbTi and bronze matrix Nb_3Sn potted superconducting magnets. Research and development report. Waltman, D.J.; Superczynski, M.J.; McDonald, F.E. (Naval Ship Research and Development Center, Annapolis, MD (USA)). Mar 1982. 24p. NTIS, PC A02/MF A01.

Two epoxy-impregnated superconducting test coils, containing 0.635-centimeter electrical heaters imbedded in their windings, have been constructed to measure the minimum energy-to-quench as a function of operating current at various fixed levels of magnetic field strength. One test coil was wound with aluminum-stabilized NbTi superconducting wire and the other coil was wound with bronze matrix Nb_3Sn superconducting wire. The results of the energy-to-quench measurements are presented for both these test coils, and these results are compared to the previous measurements made for copper-stabilized NbTi test coils.

2707 (EGG-ME—5929) INEL experience and capabilities in design, operation, and maintenance of nuclear systems. Leatham, J.; Masson, L.S. (EG and G Idaho, Inc., Idaho Falls (USA)). Jul 1982. Contract AC07-76ID01570. 43p. NTIS, PC A03/MF A01. Order Number DE83000490.

This study provides an overview of the experience, hardware, and managerial expertise available at the INEL for design, fabrication, and operation of tools and facilities for remote maintenance. The survey demonstrates that the INEL's fission reactor experience is directly applicable to the design of remote handling hardware which must be developed for fusion reactors, and that the experience and facilities are available at INEL to begin that work.

2708 (GEPP-OP—565) Quartz resonator automatic aging-measurement facility. Beetley, D.E.; Blitch, B.R.; Snowden, T.M. (General Electric Co., St. Petersburg, FL (USA). Neutron Devices Dept.). 1981. Contract AC04-76DP00656. 8p. (CONF-810550—3). NTIS, PC A02/MF A01. Order Number DE83000092.

From 35. annual frequency control symposium; Philadelphia, PA, USA (27 May 1981).

Portions of document are illegible.

A multi-channel, high precision aging measurement facility has been developed for high volume test capability with ovenized oscillators. Aging, as referred to in this report, is the frequency drift per day from an initial value. The frequency reference is traceable to the National Bureau of Standards (NBS). Computer-controlled data acquisition is used for unattended operation. This paper reviews the design considerations applied to achieve a frequency drift measurement of parts in 10^{-11} per day in a production oriented test facility. The major sub-systems of the test facility include the frequency standard, measurement scanning console, aging consoles, power system, computer system and oscillator set-up console. (WHK)

2709 (IFVE-ORI—81-128) Tolerable energy release in superconducting magnet windings under pulsed high-energy particle irradiation. Maslov, M.A.; Mokhov, N.V. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov. Inst. Fiziki Vysokikh Ehnergij). 1981. 16p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702560.

Expressions for tolerable energy density release epsilonsub(q) and excess of temperature ΔTsub(M) in accelerating-storage complex(ASC) dipole superconducting windings under irradiation have been obtained. On the basis of the boundary-value heat conductivity problem solution it is shown that the real magnet value epsilonsub(q) is always greater than superconducting cable enthalpy. It has been found that resistive region may exist in the winding for a short period of time without superconducting magnet release time r ($10^{-5} <= r <= 10$ deg s) function has been studied. Proton loss limitations in the ASC superconducting ring are given for some particular case.

2710 (IKE—5-212) Heat transfer and limiting heat transport capability in gravity-assisted heat pipes. Hung Nguyen-Chi. (Stuttgart Univ. (TH) (Germany, F.R.). Inst. fuer Kernenergetik und Energiesysteme). 5 Jun 1981. 131p. (In German). NTIS (US Sales Only), PC A07/MF A01. Order Number DE82750204.

Thesis.

The steady-state performance and the limiting heat transport capability of gravity-assisted screen-wicked heat pipes with a liquid overfill are discussed. A semi-empirical correlation between the maximum heat density, or maximum heat transport rate, and various influence parameters, viz. tilt angle, fill charge, number of screen mesh layers, screen mesh size, operating temperature, heat pipe diameter and evaporator length, is derived. Moreover, the heat transfer phenomenon within the heat pipe as well as the effect of the screen structure on the heat pipe as well as the effect of the screen structure on the bubble growth process is thoroughly investigated. Finally, the work confirms the complexity of the influence of screen mesh size and of the multiple-layer screen mesh configuration on the wall superheat required for the nucleation of the first bubbles, on the capillary force and on the wick porosity.

2711 (INIS-mf—6819, pp 627) Industrial dilution refrigerator for gamma resonance spectroscopy. Boldarev, S.T.; Kozin, M.G.; Shpinel, V.S. 1981. (In Russian). NTIS (US Sales Only), PC A99/MF A01.

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

2712 (INIS-mf—7001) Dilution refrigeration with multiple mixing chambers. Coops, G.M. (Technische Hogeschool Eindhoven (Netherlands)). 12 Jun 1981. 100p. NTIS (US Sales Only), PC A05/MF A01. Order Number DE82780773.

Thesis.

A dilution refrigerator is an instrument to reach temperatures in the mK region in a continuous way. The temperature range can be extended and the cooling power can be enlarged by adding an extra mixing chamber. In this way we obtain a double mixing chamber system. In this thesis the theory of the multiple mixing chamber is presented and tested on its validity by comparison with the measurements. Measurements on a dilution refrigerator with a circulation rate up to 2.5 mmol/s are also reported.

2713 (INIS-mf—7003) Construction of a Pomeranchuk cell driven by a ^{4}He-circulating dilution refrigerator and some related experiments. van den Brandt, B. (Rijksuniversiteit Leiden (Netherlands)). 17 Dec 1981. 76p. NTIS (US Sales Only), PC A05/MF A01. Order Number DE82780774.

Thesis.

This thesis deals with some investigations at very low temperatures in which a ^{4}He-circulating ^{3}He-^{4}He dilution refrigerator and a Pomeranchuk cooling device are used. The main theme is the design and construction of a special device, a Pomeranchuk cell that is precooled and pressurized with a ^{4}He-circulating ^{3}He-^{4}He

dilution refrigerator, that can be used to obtain a lowest temperature of the order of 1.1 mK. Furthermore, some details of the working of such a dilution refrigerator and some properties of ^{3}He-^{4}He mixtures at high pressures were investigated.

2714 **(KEK—80-4, pp 107-127) Superconducting magnets for high energy physics experiments.** Yamamoto, A. (National Lab. for High Energy Physics, Oho, Ibaraki (Japan)). Aug 1980. Dep. NTIS (US Sales Only).

From 4. TRISTAN workshop; Oho, Japan (1 May 1979).

The superconducting magnets for high energy physics experiments are discussed. The main discussion is given to thin solenoid magnets. Large, superconducting, thin solenoid magnets were developed for the detectors for colliding beam experiment. The requirements for the thin solenoid magnets are to increase the current per material weight of the coils in unit length along the axis, and to reduce the material used for the cryostats including vacuum vessels. To satisfy these requirements, aluminum-stabilized superconductors, tubular cooling systems, low mass materials and the special structure of the cryostats, and the quench protection by secondary windings have been examined. The burnout safety condition for superconducting magnets was studied by P.H. Eberhard et aland the safety condition was found. The technical estimation of a thin solenoid magnet for a TRISTAN detector was made. The design was based on the TPC magnet type, and the current density of 8×10^4 A/cm^2 was assumed. The designed magnetic field is 1.5 Tesla.

2715 **(LA-UR—82-2720) Superconducting fault-current limiter and inductor design.** Rogers, J.D.; Boenig, H.J.; Chowdhuri, P.; Schermer, R.I.; Wollan, J.J.; Weldon, D.M. (Los Alamos National Lab., NM (USA)). 1982. Contract W-7405-ENG-36. 6p. (CONF-821108—2). NTIS, PC A02/MF A01. Order Number DE83000641.

From Applied superconductivity conference; Knoxville, TN, USA (30 Nov 1982).

A superconducting fault current limiter (SFCL) that uses a biased superconducting inductor in a diode or thyristor bridge circuit was analyzed for transmission systems in 69, 138, and 230 rms kV utility transmission systems. The limiter was evaluated for costs with all components - superconducting coil, diode and/or SCR power electronics, high voltage insulation, high voltage bushings and vapor cooled leads, dewar, and refrigerator - included. A design was undertaken for the superconducting cable and coils for both diode and SCR 69 kV limiter circuits.

2716 **(NP—2904736) Investigation of operating data and economics of diesel-fuelled mine locomotives with hydrostatic gears.** Ugur, I. (Technische Hochschule Aachen (Germany, F.R.). Fakultaet fuer Bergbau und Huettenwesen). 28 Nov 1979. 111p. (In German). NTIS (US Sales Only), PC A06/MF A01. Order Number DE82904736.

Thesis.

Diesel-fuelled mine locomotives are investigated under technical and economic aspects. Theory and function of hydrostatic gears and the layout of the test bench are described. Characteristic diagrams of the diesel engines and the hydrostatic gears are explained as well as the characteristic diagrams of the locomotive which can be derived from these in consideration of the conditions within the gears. The influence of hydrometer control on gear behaviour and thus on the characteristic diagram of the locomotive is discussed. The running characteristics of locomotives with mechanical switchgears, hydrodynamic and hydrostatic gears are compared. The profitability of underground conveyance on the basis of diesel locomotives with hydrostatic drives is assessed in consideration of investment, maintenance, personnel, and energy cost.

2717 **(SAND—82-1087) STRATAPAX computer program update.** Aronson, E.A.; McCaughey, K.G.; Walton, E.L. (Sandia National Labs., Albuquerque, NM (USA)). Sep 1982. Contract AC04-76DP00789. 48p. NTIS, PC A03/MF A01. Order Number DE83002191.

There has been a continuing effort in developing the interactive Stratapax drill bit program to make it more versatile. The program now incorporates an integration method that is independent of the cutter shape. Cutter shapes can be taken to be ellipses to account for varying backrake angles. During the integration procedure derivatives are found which are used in the optimization routine, an iterative linear program used to optimize cutter placement.

2718 **(SAND—82-1284C) Effect of measurement-system phase response on shock-spectrum computation.** Walter, P.L. (Sandia National Labs., Albuquerque, NM (USA)). 1982. Contract AC04-76DP00789. 16p. (CONF-821040—1). NTIS, PC A02/MF A01. Order Number DE82022170.

From 53. shock and vibration symposium; Danvers, MD, USA (26 Oct 1982).

One of the standard methods for characterizing mechanical shock is by means of the shock spectrum. The principal application of the shock spectrum in aerospace technology is to permit component shock test specifications to be generated, independent of specific time histories. Inattention to the dynamics of the instrumentation system used to measure mechanical shock can result in distorted test data. Erroneous component test specifications will originate from shock spectra calculations based on these distorted data. Measurement system design is frequently based upon amplitude response considerations with phase response ignored. In structural testing, nonlinear phase response in measurement systems results in distorted transient data being recorded for analysis with resultant error in the computed shock spectra. Design guidelines are provided to preclude these errors from occurring.

2719 **(SAND—82-1542) Sandia National Laboratories Climatic Facilities in Buildings 6630, 6631, 9970A and 6750.** Adams, P.H.; Navoda, L.P.; Nakos, J.T. (Sandia National Labs., Albuquerque, NM (USA)). Sep 1982. Contract AC04-76DP00789. 25p. NTIS, PC A02/MF A01. Order Number DE83000998.

This document is intended to inform potential customers of the various environmental chambers available for use in testing. Descriptions of the temperature and humidity limits, data acquisition capabilities and the sizes are given for each environmental chamber. All of these chambers are located in Area III or the Coyote Test Area and are operated by Division 7531 personnel.

2720 **(UCID—19540) Analytical study of liquid metal heat pipes in a magnetic field.** Schwertz, N. (Lawrence Livermore National Lab., CA (USA)). 25 Aug 1982. Contract W-7405-ENG-48. 110p. NTIS, PC A06/MF A01. Order Number DE83002091.

Thesis.

The use of liquid metal heat pipes in a magnetic field was investigated. This was accomplished in two steps. First, a set of modified heat pipe equations to predict the heat transfer capability of a liquid metal heat pipe for the following special conditions was developed: operation in a magnetic field (MHD effect); nonuniform heating of the evaporator; and variable area adiabatic section. Then, these equations were used in a computer code to model the thermal-hydraulic performance of a liquid metal heat pipe for a specific design example.

2721 **(UCRL—87682) Optical-fabrication technology: the present and a crystal-ball view into the future. Paper No: 82-1853-CP.** Sanger, G.M. (Lawrence Livermore National Lab., CA (USA)). 5 Oct 1982. Contract W-7405-ENG-48. 28p. (CONF-821062—1). NTIS, PC A03/MF A01. Order Number DE83001177.

From AIAA/SPIE/OSA technology for space astrophysics conference; Danbury, CT, USA (4 Oct 1982).

Modern high technology optical surface manufacture makes use of one or more of four basic manufacturing technologies, loose abrasive grinding and polishing, single point diamond turning, multi-point (fixed-abrasive) machining, and position dependent material alteration. Each of these processes is described and a general comparison made with respect to achievable results, versatility and applicability to astrophysical, surveillance, and other advanced system applications. Such manufacturing technologies also offer a number of natural extensions which serve to provide, at least, a dim view down the development pathway. Such things as diamond turned visible light optics, single point machining of glass, precision fixed abrasive grinding, precise computer controlled polishing, and altered index materials are explored as offering exciting possibilities in the future.

2722 (UCRL—88269) **Mechanics of the machine-tool-workpiece system.** Brown, N.J. (Lawrence Livermore National Lab., CA (USA)). 15 Oct 1982. Contract W-7405-ENG-48. 9p. (CONF-821208—5). NTIS, PC A02/MF A01. Order Number DE83001187.

From Optical Society of America workshop on optical fabrication and testing; Palo Alto, CA, USA (13 Dec 1982).

Portions of document are illegible.

This paper is presented as a tutorial on lapping machine mechanics. Its purpose is to summarize what is known about conventional lapping machines with a minimum of mathematics. While this deprives it to some extent of the latitude and concise precision of formulae, it can reach a wider audience and treat several topics that can at present be formulated only with great difficulty.

2723 **Development of screening criteria for selecting long-distance heat transmission fluids.** Szepe, S.; Calm, J.M. (Univ. of Illinois, Chicago, USA). *Journal of Engineering for Power;* **104**: No. 2, 516-521(Apr 1982).

Selection criteria are developed for screening liquids for long-distance thermal energy transport. The model used in developing these criteria employs power function approximations for physical and economical relations. Representative fluids are discussed and compared with transmission by hot water. It is found that most thermal fluids can be rejected, because of less desirable physical properties compared with those of hot water, with the simplest of the criteria presented. 13 refs.

4203 Lasers

REFER ALSO TO CITATION(S) 2581, 2664, 2678, 3863

2724 (AD-A—112104/5) **Blue-green laser output from N(+2) and XeF. Final technical report, 1 Jan 77-31 Oct 81.** Collins, C.B. (Texas Univ., Richardson (USA). Center for Quantum Electronics). 30 Dec 1981. 201p. NTIS, PC A10/MF A01.

The objective of this work was to determine the feasibility of developing, first the helium nitrogen charge transfer laser, and later the XeF laser into efficient scalable devices excited by preionized discharges for the production of blue-green outputs. The performance and scalability of the N2(+) laser pumped by charge transfer from He2(+) was determined in such a discharge environment. The gain and saturation parameters were measured and a regenerative amplifier capable of operation at 470.9 nm was constructed. A traveling wave device was built which at 427 nm produced peak powers of 5 MW in the forward direction and which had a front-to-back ratio of 10,000 to 1 for the pulse energies. Efforts were made to apply that technology to the problem of switching the output from a XeF laser into the C yields A transition at 480 nm. Gain and saturation parameters were examined and it was found that the relative gains between the stronger UV transition and the blue-green transition were greater than 30 to 1. These results implied that the blue-green transition of XeF was too weak to support the development of any practical device pumped by a preionized discharge.

2725 (AD-A—112107/8) **Optimization of efficiency of a discharge-excited XeCl laser. Interim technical report, 22 October 1981-21 February 1982.** Rothe, D.E. (Helionetics, Inc., San Diego, CA (USA). Laser Div.). Mar 1982. 36p. NTIS, PC A03/MF A01.

This work supports the Navy's strategic blue-green laser communication program. The specific goal is to raise the efficiency of an electric-discharge-excited XeCl laser to 3% or better. Efficient XeCl lasers are prime candidates for a satellite-borne laser transmitter. During the first four months of this contract, the design, construction and assembly of a versatile XeCl laser test bed was completed. Initial checkout and performance tests are in progress. Without optimization of the pulse-forming-network, optical cavity and gas mixture, the laser has produced optical pulses with energies in excess of 1 joule with efficiencies over 1%. Prospects for raising these characteristics to 2 joules and 3% with proper optimization and injection locking are very good.

2726 (AD-A—112122/7) **Quantum mechanics applied to dye lasers.** Pearce, C.K. (Army Electronics Research and Development Command, Fort Belvoir, VA (USA). Night Vision and Electro-Optics Labs.). Sep 1981. 32p. (DELNV-TR—0024). NTIS, PC A03/MF A01.

The application of quantum mechanics to dye laser theory is reviewed, based upon recent semiclassical and fully quantum mechanical studies. Both semiclassical and fully quantum mechanical approaches were included. Phenomena investigated in the dye laser medium included spectral hole burning, propagation of light pulses, and light absorption and emission. Some studies realistically included consideration of the triplet state. Mixtures of lasing dyes, or of lasing and saturable absorber dyes, were not treated, nor were vapor dye lasers. Theoretical limitations that might be inherent in dye lasers, such as gain and power output, are other important areas that deserve examination in future studies.

2727 (AD-A—113039/2) **Elementary excitations in narrow-gap semiconductors by picosecond infrared pulses. Final report 1 Jan 77-31 Dec 81.** Nurmikko, A.V. (Brown Univ., Providence, RI (USA). Dept. of Engineering). 23 Feb 1981. 23p. NTIS, PC A02/MF A01.

In this grant research, we have demonstrated efficient switching of high-power carbon dioxide laser radiation at picosecond speeds in the narrow-gap semiconductors indium antimonide, lead telluride, and mercury cadmium telluride. Excitation from a modelocked Nd: glass laser has been used to generate pulses of 10 micrometer radiation of approximately 2psec in duration by a dense transient electron-hole gas in these materials. This work takes advantage of the unique material properties of the narrow-gap semiconductors.

2728 (AD-A—113659/7) **Low voltage free electron laser optics.** (Schafer (W.J.) Associates, Inc., Wakefield, MA (USA)). 5 Mar 1982. 59p. NTIS, PC A04/MF A01.

We investigated several methods of reducing the pump cavity losses in a two stage free electron laser. We have found that with metal optics, we can reduce the round trip cavity absorption losses to approx. = 0.2% with some difficulty. The cavity wall losses can be significantly decreased by resorting to superconducting optics. The limitations of this system is that the operating wavelength has to be a few millimeters and the operating temperature has to be < 2 deg K to keep the refrigeration power at a reasonable level. One has also to pay the price of the complexity of the system. For near term UCSB experiment, it was felt that room temperature silver coated optics would be the best choice. To expand the optical beam to low flux levels that the mirrors can handle, it was necessary to use near concentric resonator geometry. For such a configuration, the diffraction losses could be maintained < .0001 by choosing Fresnel number greater than or equal to 15.

2729 (DOE/ET/33047—1) **Investigation of XeF as a high-repetition-rate pump laser. Final report.** (Mathematical Sciences Northwest, Inc., Bellevue, WA (USA)). Jun 1979. Contract AC06-77ET33047. 53p. (MSNWP—1079). NTIS, PC A04/MF A01. Order Number DE82022219.

The goals of the present contract were to study discharge/uv-preionization geometries compatible with a flowing system, to investigate more efficient uv preionization by separating the uv source from the gas discharge, and to try to identify the mechanism leading to gas degradation by making gain and uv-absorption measurements as a function of number of pulses on a static gas fill. Two discharge/uv-preionization geometries compatible with a flowing system were investigated. One involved two solid electrodes with preionization from one or both sides and the other utilized preionization from behind a screen electrode. The highest laser energy and the largest discharge volume were obtained with the screen cathode configuration. Details of these experiments and of parametric studies aimed at maximizing the extracted laser energy and efficiency are described. The efforts to improve the preionization efficiency by separating the uv source from the gas discharge are described. None of the alternate gases tried gave any significant improvement in performance. An investigation of the decay in both KrF and XeF laser output energies for multiple pulses on a single gas fill indicated that the uv sparks alone were responsible for

about half of the observed degradation. Gain and absorption measurements for the XeF laser as a function of number of pulses on a single gas fill suggest that the degradation is due to formation of an impurity molecule which quenches the upper laser level or interferes in its formation and not to production of an absorbing species. Because of the similarity between the XeF and KrF laser systems and because higher output energies can be obtained from the KrF laser, a parallel investigation was carried out for the KrF laser and is described. (WHK)

2730 **(UFF-IF—06/81) Brazilian N_2 laser similar to imported models.** dos Santos, P.A.M.; Tavares, A.D. Jr.; da Silva Reis, H.; Tagliaferri, A.A.; Massone, C.A. (Universidade Federal Fluminense, Niteroi (Brazil). Inst. de Fisica). Sep 1981. 18p. (In Portuguese). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82703141.

The development of a high power N_2 Laser, similar to imported models but built enterely with Brazilian materials is described. The prototype shows pulse repetitivity that varies from 1 to 50 per second and has a peak power of 500 kW.

2731 **(UFF-IF—07/81) New simple and efficient-method to obtain pre-ionization in gas lasers.** Tavares, A.D. Jr.; dos Santos, P.A.M.; Massone, C.A.; Tagliaferri, A.A. (Universidade Federal Fluminense, Niteroi (Brazil). Inst. de Fisica). Sep 1981. 14p. (In Portuguese). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82703142.

The problem caused by the increase of the gas column impedance, with the pressure increase, in a Nitrogen laser, is studied.

2732 **(UFF-IF—08/81) Influence of the electrode temperature in the functioring of a CO_2 laser.** Leite, C.A.F.; Costa, E.V.; Tagliaferri, A.A.; Massone, C.A. (Universidade Federal Fluminense, Niteroi (Brazil). Inst. de Fisica). Sep 1981. 9p. (In Portuguese). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82703143.

Some parameters that affect the CO_2 laser functioning are analized. Such parameters are: the electrode refrigeration and the electrode shape.

2733 **(UFF-IF—09/81) Population inversion mechanism in Nitrogen.** Tagliaferri, A.A.; Massone, C.A. (Universidade Federal Fluminense, Niteroi (Brazil). Inst. de Fisica). Sep 1981. 60p. (In Portuguese). NTIS (US Sales Only), PC A04/MF A01. Order Number DE82703144.

A review is made on work developed, on nitrogen molecular lasers. The population inversion mechanisms in Nitrogen are discussed. A historical evoluation of gas lasers is presented.

2734 **(UFF-IF—10/81) High power, high-pressure N_2 laser.** de Moraes, R.A.V.; Fellows, C.E.; da Silva Reis, H.; Massone, C.A.; Tagliaferri, A.A. (Universidade Federal Fluminense, Niteroi (Brazil). Inst. de Fisica). Sep 1981. 10p. (In Portuguese). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82703145.

The construction of an N_2 laser of extrem simplicity, high power, reduced dimensions and atmospheric pressure of operation is reported.

2735 **Calculation of gain at X-ray wavelengths resulting from optical pumping of helium-like ions.** Alley, W.E.; Chapline, G. (California Univ., Livermore (USA). Lawrence Livermore National Lab.); Kunasz, P. (National Bureau of Standards, Boulder, CO (USA). Lab. Astrophysics Div.); Weisheit, J.C. (Princeton Univ., NJ (USA). Plasma Physics Lab.). *Journal of Quantitative Spectroscopy and Radiative Transfer;* **27**: No. 3, 257-266(Mar 1982).

From Radiative properties of hot dense matter; Monterey, California, USA (17 - 20 Nov 1980).

An equivalent two level scheme is described for calculating level populations of helium-like ions in dense optically thick plasmas. The scheme is used to show how population inversions due to optical pumping of 3P or 4P states are affected by line trapping. The importance of various line broadening mechanisms for determining gain is briefly discussed.

2736 **Hybrid unstable resonator laser cartridge.** Safyurtlu, A.C.; Wisnieff, R.E. US Patent Application 6,340,574. 18 Jan 1982. 8p.

A hybrid unstable resonator cartridge is described comprising a Nd:YAG laser rod, passive Q-switch, resonator and collimating optics which are bonded together to form an integral assembly with the Q-switch being configured of a nickel-complex dyed polymethylmethacrylate plastic whose optical density is accurately controlled. Additionally, the bonding of the components is made by an optical grade adhesive having the required mechanical properties to bond and ensure the stability of the integrated structure over relatively wide ranges of temperature and shock encountered in portable applications.

2737 **Frequency stabilization for two-mode laser.** Hall, J.L. US Patent Application 6,300,363. 8 Sep 1981. 22p.

Frequency stabilization is disclosed for a two-mode laser, such as a Zeeman laser. The emission frequency of the laser is servo-stabilized to the center of the atomic gain curve to provide a stable laser reference frequency that is independant of time and environmental operating conditions. Stabilization in a longitudinal-field Zeeman laser is achieved by utilizing the mode-pulling effect which makes the frequency difference between the two circular polarization components have a parabolic dependence on the optical frequency of the laser. The detected intermode beat frequency from the laser is subjected to digital phase-sensitive, drift-free integration, using a reversible counter, to provide a cumulative count with a rate of increase corresponding to the displacement of the average wavelength from the atomic center wavelength and an analog error-correction signal is generated therefrom which is coupled to the laser. The error-correction signal is processed and coupled to the piezoelectric crystal which controls the emission frequency of the laser for fast laser frequency correction control, and may be also processed and coupled to the heater coil on the laser for thermally providing slow frequency correctional control.

4204 Heat Transfer And Fluid Flow

REFER ALSO TO CITATION(S) 1551, 1968, 2060, 2149, 2710, 2723

2738 **(EPRI-NP—2080-Vol.6) STEALTH: a Lagrange explicit finite difference code for solids, structural, and thermohydraulic analysis. Volume 6: piping systems manual. Computer code manual.** Cohen, L.M. (Science Applications, Inc., San Leandro, CA (USA)). Mar 1982. 205p. NTIS, PC A10/MF A01. Order Number DE83900272.

This volume documents the STEALTH piping numerical code, which can simulate the time-dependent flow phenomena that occur in piping systems. This volume also contains the input instructions for the STEALTH piping code, and a sample problem of a pipe flow simulation.

2739 **(GKSS—81/E/35) Comparison of various CHF-data performed in different fluids and test sections with various CHF-correlations.** Katsaounis, A. (GKSS-Forschungszentrum Geesthacht G.m.b.H., Geesthacht-Tesperhude (Germany, F.R.)). 1981. 26p. (CONF-8106210—1). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82750202.

From European two-phase flow group meeting; Eindhoven, Netherlands (2 Jun 1981).

Three CHF-correlations called CISE, AHMAD and TONG valid for round tubes, annuli and multirod bundle test sections are compared with 3000 experimental data performed in different test sections for a large variation of experimental parameters and for different coolants (water, Freon 12, 22, 113, 114, ammonia, polyphenyl, potassium, hydrogen and nitrogen). The CISE-correlation can be applied to predict the CHF-condition in the range of 0 <= xsub(CHF) <= 0.6 considering a fluid and geometry dependent 'K'-factor. The TONG-correlation predicts the fluid independent CHF-condition with good accuracy in the subcooled boling region (ω <= 0.35). Finally, all water and Freons data in range of -4.47 <= xsub(CHF) <= 1.0 correlated by AHMAD-correlation show a larger scattering than the forgoing two correlations.

2740 (GKSS—81/E/52) Solution of fluid flow problems by a direct spline interpolation method. Haeuser, J.; Eppel, D.; Tanzer, F. (GKSS-Forschungszentrum Geesthacht G.m.b.H., Geesthacht-Tesperhude (Germany, F.R.)). 1981. 23p. Dep. NTIS (US Sales Only), MF A01. Order Number DE82750563.

The present paper reports on the investigation and results of a direct cubic spline procedure for the numerical approximation of first and second spatial derivatives and its application to fluid flow problems. The method developed, utilizing a uniform mesh, does not demand the solution of a system of linear equations, rather the spline coefficients are determined by analytical formulas depending on the boundary values and the eigenvalues of a 2 x 2 matrix. The method is applied to the solution of the nonlinear one-dimensional Burgers equation, the atmospheric boundary layer equations, and to the diffusion equation, where the medium moves at a constant and uniform velocity.

2741 (IKE—2-51) Experiments on the mechanisms inducing steam explosions. Froehlich, G.; Anderle, M. (Stuttgart Univ. (TH) (Germany, F.R.). Inst. fuer Kernenergetik und Energiesysteme). Apr 1980. 136p. (In German). Dep. NTIS (US Sales Only), MF A01. Order Number DE82750203.

To attain an optical insight into the events just before, during and after a vapour explosion with various molten metal-water-configurations, high-speed photography has been applied, a demonstration of which is given in this report. It is shown that a shock-wave passing the melt is able to initiate the fragmentation process. In this context the influence of shock-wave induced collapse of the vapour blanket as well as the collapse of the cavitation bubbles, which are built in the aftermath of the shock-wave, is examined with regard to the initiation of a vapour explosion. Based on the realizations deriving from the experiments, a valuation of the actual models on vapour explosion-ignition is tried.

2742 (NP—2904446) Development and testing of a standard apparatus to measure the heat transfer in nucleate boiling. Goetz, J. (Karlsruhe Univ. (TH) (Germany, F.R.). Fakultaet fuer Chemieingenieurwesen). 20 Dec 1980. 91p. (In German). NTIS (US Sales Only), PC A05/MF A01. Order Number DE82904446.

Thesis.

The present work treats the development and testing of a standard apparatus to determine the heat transfer coefficient during nucleate boiling. A horizontally hanging copper tube in a relatively large liquid bath which is indirectly electrically heated was chosen. The standard apparatus is firstly tested by random sampling, by heat transfer measurements with various coolants in a large region of the standardized boiling pressure. Furthermore, the extent to which the dependence of the local heat transfer coefficient in the angle at the circumference influences the determination of an average heat transfer coefficient, which one considers when designing an overflooded shell tube evaporator, is determined. Lastly, the influence of the surface on the heat transfer coefficient is discussed.

2743 (NP—2904450) Velocity of sound and critical mass transport in one- and two-component gas-liquid-flows. Nguyen, D.L. (Technische Univ. Muenchen (Germany, F.R.). Fakultaet fuer Maschinenwesen). 25 Feb 1981. 77p. (In German). NTIS (US Sales Only), PC A05/MF A01. Order Number DE82904450.

Thesis.

The aim of this work is to cover the literature for the subject velocity of sound and critical mass transport in one- and two-component gas-liquid-flows, to evaluate published theoretical models and to present a critical comparison with experimental data. In addition an attempt is made to establish an analytical model to describe the propagation of sound in one-and two-component gas-liquid flows. The model is applied to flows with a layer type phase distribution, a plug-type distribution and in particular to flows with a homogenious phase distribution and comparision is made with published experimental results. On this basis a relation is derived to determine the critical mass transport in gas-liquid flows.

2744 (NP—2904732) Experimental study of heat and mass transfer in a turbulent, plane jet with periodical excitation at the nozzle. Korschelt, D. (Technische Univ. Berlin (Germany, F.R.)). 4 Jan 1980. 123p. (In German). NTIS (US Sales Only), PC A06/MF A01. Order Number DE82904732.

Thesis.

In the present study a two-dimensional jet is heated on one side and excited by a loudspeaker at the nozzle. The influence the resulting extended vortex structures on the heat and mass transfer are described, based on simultaneous temperature measurements with several probes distributed in the jet cross-section. In addition the flow has been visualized by smoke using the methods of laser light cut (long time exposure), flash light (short time exposure) and stroboscopy (phase mean value). The vortex induced velocity and temperature fluctuations result in an enhanced heat and mass transfer. These fluctuations are detected with x-wires and temperature probes using analog data processing. In order to determine the velocity-temperature correlations, the velocity and temperature signals have been decoupled electrically.

2745 (NUREG/CR—2619) Hydrodynamic instability and thermal convection in a horizontal layer of two immiscible fluids with internal heat generation. Final report 1 Jul 75-30 Jun 80. Kulacki, F.A.; Nguyen, A.T. (Ohio State Univ. Research Foundation, Columbus (USA)). Mar 1982. 199p. NTIS, PC A09/MF A01.

Results are reported of experimental and theoretical investigations of thermal convection in a horizontal layer composed of two immiscible fluids, with uniform internal energy generation in the lower sublayer. A linear stability analysis, numerical study, and experimental measurements are presented. The fluid layer is bounded from below by a rigid, insulated surface and from above, by a rigid isothermal surface. In the stability analysis, conditions for the onset of convection via the linearized perturbation approach are obtained by evaluation of a determinant of a matrix comprising two working matrices that are associated with each fluid sublayer. A simple explicit finite-difference technique is used for the numerical solution of the partial differential equations governing the temperature and flow fields.

2746 One-dimensional transport from a highly concentrated, transfer type source. O'Neill, K. (US Army Cold Reg Res and Eng Lab, Hanover, NH, USA). *International Journal of Heat and Mass Transfer;* **25**: No. 1, 27-36(Jan 1982).

In both heat and mass transfer, situations arise in which an entity considered as a source/sink has strength which can only be expressed in terms of an unknown rate of source - flow field transfer. This occurs when transfer between the source and medium is driven by a dependent variable difference which is unknown, because the responding medium value is unknown. Manifold mathematical complexities arise when in addition the source is highly concentrated spatially, relative to the size of the overall domain. A 1-dim. convective-diffusive transport equation suitable for this case may be solved by simultaneous use of the Fourier transform and its inverse in the same equation, together with other transformation and manipulation. 27 refs.

2747 Convective heat transfer with a periodic longitudinal heat flux variation. Clements, L.D.; Lee, Y.F. (Texas Tech University, Lubbock, TX). pp 21-37 of Heat Transfer and Fluid Mechanics Institute. Stanford, CA; Stanford University Press (1980).

From Heat transfer and fluid mechanics institute; Los Angeles, CA, USA (23 Jun 1980).

The effects of longitudinally periodic heat flux profile on forced convection heat transfer are considered in a single phase liquid, subcooled boiling, and low-quality two-phase flow boiling conditions. Tests were made at low pressure in a Joule-heated container with an exterior wall of thickness varied in a stepwise fashion. The variation in thickness was sufficient to modify the resistance generated wall heat flux when direct current passed through the tube walls. The overall average forced convection boiling heat transfer coefficient was about half of the predicted value for flow boiling water under constant heat flux boundary conditions.

4205 Materials Testing

REFER ALSO TO CITATION(S) 1548, 2572, 2617

2748 **(AD-A—113500/3) Non-destructive evaluation of defects in structural materials using long-wavelength neutrons. Annual report No. 3, Nov 80-Dec 81.** Fatemi, M.; Rath, B.B. (Naval Research Lab., Washington, DC (USA)). 2 Apr 1982. 37p. NTIS, PC A03/MF A01.

Small-angle neutron scattering (SANS) measurements have been performed on several structural alloys to study voids and microporosities in powder consolidates of Al- and Fe-base alloys. The evolution of precipitates in Al-4%Cu and in beta-III Ti (Ti-11Mo-7Zr-5Sn-0.08Fe-.015C-0.012-0.1O) alloys subjected to varying annealing temperatures and times, and the nucleation and growth of voids formed during creep and superplastic forming in (Cu-3Al-2Si-.5Zn-0.4Co) alloys. The theta" to theta' phase transformation in Al-4%Cu has been measured and analyzed. Calculated size density distributions show the coarsening of theta' phase with simultaneous disappearance of theta" as a function of annealing times at 190 C. From these observations, the average size of precipitates at each stage has been calculated and compared with electron micrographic results. Similarly the precipitation of omega-phase in beta-III titanium has been observed for several annealing temperatures (600 F to 800 F) and aging times (2 min. to 100 hrs.). The observation of pronounced peaks in the small-angle profiles leads to an evaluation of the coherence length resulting from a clustering of precipitates. Microporosity in powder consolidates has been studied in two alloys: (Fe-21Cr-6Ni-9Mn-0.02C-0.25N (Wt%)) and Ti-6Al-4V. The analysis shows a variation of Guinier slopes consistent with the expectations of pore size and density variation as a function of the compaction pressure and temperature. Finally, preliminary measurements on superplastically deformed alloys of (Cu-3Al-2Si-.5Zn-.4Co) have been made under varying conditions of strain and strain rates to determine creep-induced void densities.

2749 (GRS—17(8-80), pp 331-338) **Training of quality assurance personnel with regard to nondestructive testing and documentation.** Schaper, H.; Fischer, E. Aug 1980. (In German). NTIS (US Sales Only), PC A19/MF A01.

From Symposium on personnel organization and qualification by establishment and operation of nuclear power stations; Koeln, F.R. Germany (10 Jun 1980).

Training of NDT personnel by the employer, in technical high-schools and universities, in academies and welding institutes is discussed. NDT training by the DGZfP: qualification system - training courses - extent of training is summarized. Records management and training are described.

2750 **(ORNL/Sub—79-13673/1) Review of the state-of-the-art of nondestructive evaluation of advanced composite materials.** Henneke, E.G. II; Duke, J.C. Jr. (Virginia Polytechnic Inst. and State Univ., Blacksburg (USA). Dept. of Engineering Science and Mechanics). Sep 1979. Contract W-7405-ENG-26. 91p. NTIS, PC A05/MF A01. Order Number DE83000983.

A review of the literature on the nondestructive testing of advanced composites is presented. The report is categorized according to the reinforcing filament in the composite system. A number of nondestructive evaluation methods have proven suitable for detecting specific types of flaws in composites: fiber-matrix debonds, delaminations, matrix crazing, fiber misalignments, resin-rich or resin-poor regions, etc. However, the literature is lacking, in general, any definitive conclusions concerning the effect these detected defects have upon the mechanical properties of the composite, such as stiffness, strength, residual strength, or expected lifetime.

2751 **(PB—82-207267) Comparison between shear wave ultrasonic examination and radiographic examination of some austenitic stainless steel pipe welds.** Juva, A. (Valtion Teknillinen Tutkimuskeskus, Espoo (Finland). Metallilaboratorio). Mar 1979. 29p. NTIS, PC A03/MF A01.

This paper compares the results of the ultrasonic and radiographic examinations of five austenitic pipe to pipe welds, which contained different types of intentional weld defects. Comparison between the results of the ultrasonic and radiographic examinations leads to the conclusion that neither method gives quite satisfactory results. Both methods missed some defects and the correlation between the results of the methods was not very good. In the ultrasonic examination the most difficult problem was the evaluation of the defects.

2752 **(PNL-SA—10446) Classification of NDE waveforms with autoregressive models.** Melton, R.B. (Pacific Northwest Lab., Richland, WA (USA)). Aug 1982. Contract AC06-76RL01830. 14p. (CONF-820820—8). NTIS, PC A02/MF A01. Order Number DE83002036.

From Review of progress in quantitative NDE; San Diego, CA, USA (1 Aug 1982).

Portions of document are illegible.

This paper describes a new approach for classifying NDE waveforms. Using this approach a set of matched filters are constructed, one for each category of waveform, based on parameters from autoregressive models. The method offers advantages in terms of hardware implementation over conventional pattern recognition approaches. Feasibility is shown using computer generated data. Results are then presented for real data from acoustic emission experiments.

2753 **(UCRL—88293) Inverse Born Approximation: exact determination of shape of convex voids.** Opsal, J.L. (Lawrence Livermore National Lab., CA (USA); Ames Lab., IA (USA)). 1982. Contract W-7405-ENG-48. 12p. (CONF-820820—7). NTIS, PC A02/MF A01. Order Number DE83000836.

From Review of progress in quantitative NDE; San Diego, CA, USA (1 Aug 1982).

Portions of document are illegible.

The Inverse Born Approximation (IBA) to the elastic wave inverse scattering problem is known to give highly accurate results for the shape of complex voids. In this paper we present an argument demonstrating that the IBA is, in fact, exact for determining the size, shape and orientation of a wide class of these scatterers given infinite bandwidth and unlimited aperture information. Essentially, our argument demonstrates how the IBA algorithm picks out the singular contribution to the impulse response function and correctly relates it to the shape of the scatterer. Some specific examples will be used to illustrate the more intuitive aspects of the discussion.

2754 **Nondestructive evaluation and energy technology: a workshop summary.** Gubernatis, J.E.; Krumhansl, J.A. (Los Alamos Scientific Lab., NM (USA)). *Materials Science and Engineering;* **52**: No. 3, 195-206(Mar 1982).

The findings of a recent Workshop on Non-destructive Evaluation (NDE) are summarized. One purpose of the Workshop was to recommend basic research programs to develop the scientific base for improvements in NDE capabilities. The research programs recommended span such disciplines as physics, mathematics, materials science, mechanical engineering and electrical engineering and include research with such objectives as developing quantitative relationships for the interaction of various types of penetrating radiation (elastic and electromagnetic waves, X-rays, gamma rays, neutrons etc.) with important material structures (flaws, welds, cladding, grain structure etc.) and for the influence of these structures on material performance (fracture, fatigue etc.). Additional research recommendations include examining the inverse problem in general and acoustic emission in particular, promoting advanced instrumentation development for improved signal detection and discrimination, for in situ and real-time operation and for generation of more easily interpretable data forms (e.g. imaging and tomographic methods), and consciously promoting research on relevant promising new phenomena and methods. An important facet of the research recommendations is the affirmation of the interdisciplinary character of NDE and the importance of interdisciplinary appproaches to the research.

4208 Electronic Circuits And Devices

REFER ALSO TO CITATION(S) 3897

2755 **(BDX—613-2833) Bond properties of liquid adhesive.** Bohnert, G.W. (Bendix Corp., Kansas City, MO (USA)). Oct 1982. Contract AC04-76DP00613. 12p. NTIS, PC A02/MF A01. Order Number DE83001743.

Studies were conducted on a liquid adhesive used to bond circuit laminates to rigid plastic components. Areas investigated include: adhesive formulation, factors influencing bond strength, laminate cleaning, and automated adhesive application.

2756 **(BMFT-FB-T—82-049) New device technology for standardization of processing steps and improvement of efficiency of light emitting diodes.** Jakowetz, W.; Packeiser, G. (Bundesministerium fuer Forschung und Technologie, Bonn (Germany, F.R.)). Apr 1982. 128p. (In German). NTIS (US Sales Only), PC A07/MF A01. Order Number DE82750643.

A new method of liquid phase epitaxy has been developed for the fabrication of GaP:N-diodes, where a thin melt is limited at the bottom and the top by a substrate (sandwich epitaxy). In regard to standardization of processing steps the effect of cleaning procedures has been investigated by Auger electron spectroscopy for different III-V-compund wafers. The application of Al-Zn as standard contact for p-type material was tested. A suitable reflecting metallisation for the chip backside of LED with transparent substrate has been developed. A third essential point was the characterization of GaAsP:N vapor phase epitaxial wafers. The origin of crystal defects and their influence on efficiency has been investigated. Furthermore a testing method as means of process control has been developed, which allows to measure all parameters which determine the efficiency of a LED.

2757 **(BMFT-FB-T—82-050) Crystal defects in silicon integrated circuits with respect to very large scale integration (VLSI).** Franz, G.; Kolbesen, B. (Bundesministerium fuer Forschung und Technologie, Bonn (Germany, F.R.)). Apr 1982. 56p. (In German). NTIS (US Sales Only), PC A04/MF A01. Order Number DE82750644.

The impact of process-induced crystal defects on silicon devices in bipolar and MOS-technologies was investigated. Analytical techniques for detection of crystal defects were preferential etching, X-ray topography and high voltage electron microscopy. Impurity levels were determined by infrared spectroscopy. Impurity levels were determined by infrared spectroscopy (carbon and oxygen) and neutron activation analysis (metals). Device characteristics and measurements of the MOS-relaxation time were utilized as the most important electrical results for quality control. Nuclei, sources and driving forces were analysed, correlated to special technology steps and measures for elimination were determined. As a result metallic impurities introduced during wafer processing influence as well the generation as the electrical activity of crystal defects. The gattering ability of defects, generated due to the precipitation of oxygen in CZ-silicon was analysed.

2758 **(BMFT-FB-T—82-052) Bipolar integrated consumer circuits.** Buergerhausen, F.; Hintzmann, K.D.; Hoeppner, D.; Kaiser, R.; Krumrein, D.; Kuisl, M.; Lackner, P.; Mattfeld, J.; Rinderle, H.; Seybold, C. (Bundesministerium fuer Forschung und Technologie, Bonn (Germany, F.R.)). Apr 1982. 37p. (In German). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82750645.

This report describes the development of monolithic integrated circuits for radio and video applications. Techniques of circuit design and measurement and problems of technology are discussed.

2759 **(LA-UR—82-2726) Progress on the gyrocon deflection-modulated amplifier.** Tallerico, P.J. (Los Alamos National Lab., NM (USA)). 1982. Contract W-7405-ENG-36. 5p. (CONF-821207—2). NTIS, PC A02/MF A01. Order Number DE83000632.

From IEEE international electron devices meeting; San Francisco, CA, USA (13 Dec 1982).

The gyrocon is a high-power deflection-modulated amplifier that can have excellent spatial bunching and, hence, high dc-to-rf conversion efficiency. A program to design and build a prototype amplifier at 450 MHz is discussed. Peak powers of 150 kW and conversion efficiencies of 23% have been measured; the testing program is being pursued to improve this performance. Some possible mechanisms for the difference between the experimental and calculated performance are discussed.

2760 **(SAND—82-1323C) Evaluation of Al/sub x/Ga/sub 1-x/As for high-temperature electronic-junction-device applications.** Zipperian, T.E.; Dawson, L.R.; Barnes, C.E. (Sandia National Labs., Albuquerque, NM (USA)). 1982. Contract AC04-76DP00789. 16p. (CONF-820960—1). NTIS, PC A02/MF A01. Order Number DE82022164.

From International symposium on GaAs and related compounds; Albuquerque, NM, USA (20 Sep 1982).

Portions of document are illegible.

Mesa-isolated, p^+nn^+, GaAs/Al/sub x/Ga/sub 1-x/As/GaAs ($0.10 < x < 0.5$), double-heterojunction diodes are examined over the full temperature range from 50 to 400°C. Al/sub x/Ga/sub 1-x/As is selectively used to suppress reverse junction leakage. GaAs is used for heterojunction contacts and as an encapsulant for the chemically reactive Al/sub x/Ga/sub 1-x/As. An AlAs concentration of approximately 30% was found to provide significant improvements in the high-temperature reverse junction leakage (compared to GaAs homojunctions) without the necessity of going to higher values of x. Extending the diode work to three-terminal devices, a heterojunction-collector bipolar junction transistor was fabricated. These results demonstrate that Al/sub x/Ga/sub 1-x/As coupled with GaAs for contacting and encapsulation is a good materials system for high-temperature junction device applications.

4209 Waste Processing Plants And Equipment

REFER ALSO TO CITATION(S) 1575

2761 **(BMFT-FB-T—81-232) Comparative analysis of the efficiency, reliability, technical feasibility and costs of methods to convert sewage sludge to a hygienically safe condition.** Fuhrmann, D.; Leschber, R.; Mueller, G.; Jaeger, B.; Neumann, U. (Bundesministerium fuer Forschung und Technologie, Bonn (Germany, F.R.)). 1981. 187p. (In German). Dep. NTIS (US Sales Only), MF A01. Order Number DE82750537.

Due to the development of sewage treatment technology and the construction of new and sewage works and enlargement of older ones, increasing amounts of sewage sludge have been produced. Agricultural use of municipal sewage sludge is a practicable way of utilization which, however, is often limited for reasons of hygienic safety. The present study intends to describe methods of sewage sludge disinfection which have been used in practice or tested extensively, as well as technical innovations in this field, and to give information on their performance with respect to hygienic and technical requirements. A direct comparison of processes has turned out to be extremely difficult because disinfection of sewage sludge is only one of the stages of sewage treatment. For comparison, numerous factors have to be taken into account such as plant size, type of sewage and sludge treatment processes, energy costs, sales potential for agricultural use etc. This study is meant as an aid in such work.

4210 Combustion Systems

REFER ALSO TO CITATION(S) 2058, 2439, 2451, 2456, 2497, 2766

2762 **(DOE/FE/16123—T1) Investigation of advanced catalytic combustion with SORCAT systems. Semi-annual report.** (BENMOL Corp., Alexandria, VA (USA)). Oct 1982. Contract AC21-81FE16123. 60p. NTIS, PC A04/MF A01. Order Number DE83000193.

Portions of document are illegible.

This report describes the work performed during the period of October 1981 through June 1982. This includes: (1) formulation

of SORCAT (sorbent-catalyst) groups A, B, and C; (2) preparation of eighteen samples; (3) analysis of properties of samples prepared; and (4) screening tests of all samples. A total of nineteen screening tests were performed with the prepared SORCAT samples and a sample of limestone in a packed bed differential reactor at about 1550°F using a gas mixture composed of O_2, CO, CH_4, SO_2, NO and N_2. Three of these samples with best overall performance will undergo further testing with coal in a four-inch fluidized bed combustor. In summary, the results to date have shown that SORCAT materials can effectively remove potential environmental pollutants to very low levels and therefore offer a very viable alternative to the use of limestone in coal combustion technology.

2763 **(PB—82-200668) Industrial burner and process efficiency program. Annual report Jan-Dec 81.** Huebner, S.R.; Prakash, S.N. (Midland-Ross Corp., Toledo, OH (USA). Technical Center - Thermal Systems). Mar 1982. 152p. NTIS, PC A08/MF A01.

A high velocity, multi-fuel, preheated air, staged combustion scheme, pulse firing burner has been developed together with a digital control scheme using the frequency modulation (FM) method of regulating the number of duration of pulse firing of the burner for process temperature control. Proof of concept test in a batch hardening furnace is planned next to evaluate this FM combustion system under furnace operating conditions. Laboratory test data has indicated gains in heating rate and improvements in product temperature uniformity. Present methods of operation usually involve the use of excess air operations. Compared to the present systems, the FM combustion system is economically feasible with payback periods of 1 1/2 to 2 1/2 years.

4220 Underground Engineering

REFER ALSO TO CITATION(S) 1609

2764 **(NP—2904713) Soil lift in German coal mines and countermeasures.** Oldengott, M. (Technische Univ. Berlin (Germany, F.R.). Fachbereich Bergbau und Geowissenschaften). 18 Jul 1980. 224p. (In German). NTIS (US Sales Only), PC A10/MF A01. Order Number DE82904713.

Portions of document are illegible.

Rock mechanics processes are described which may cause strata movement and floor lift. Regression formulas to calculate convergence and floor lift are discussed. Measures to prevent or reduce floor lift are discussed, e.g.: Anchoring; injection; anchoring combined with injection; concrete archer with and without supports; beds of solidified crushed rock; floor reinforcement with sill beams and braces; pressure relief by means of grooved floors, perforated floors, or stress relief blasting; combined anchoring and grooves for reinforcement and stress relief.

2765 **(PB—82-195900) Representative ground parameters for structural analysis of tunnels. volume 4. case studies. Final report.** Hampton, D.; Jin, J.S.; Hu, C.C. (Hampton (Delon) and Associates, Rockville, MD (USA)). Jan 1982. 163p. NTIS, PC A08/MF A01.

This report is the fourth in a series reporting the results of the above titled study. This document, Volume 4, is principally concerned with summarization of published case studies on tunnel design and construction with a view toward highlighting lessons learned and benefits received from a rigorous subsurface investigation for tunnel design and construction. Volume 3 is principally concerned with summarization of currently used analytical design procedures, ascertaining the geotechnical parameters required as input into these design procedures, and assessing the significance of these geotechnical parameters. Volume 2 is principally concerned with in situ site investigation techniques, but also considers the preliminary phases of a site investigation program, classification and correlation systems applicable to underground design and construction, and large-scale field testing procedures. Volume 1 is concerned with the thought processes and considerations related to the planning and implementation of site investigation programs for tunnel design and construction. It is intended that these documents will provide guidance to those engineers responsible for the planning and implementation of site investigation programs related to tunnel design and construction. This report also will be of value to owners, contractors, and others in the underground construction community.

4240 Pollution Control Equipment

REFER ALSO TO CITATION(S) 1577, 2762, 2969

2766 **(BMFT-FB-T—82-034) Investigations for the use of tornado dust collector after pressurized fluidized-bed combustion furnace.** Pieper, R.; Weber, E. (Bundesministerium fuer Forschung und Technologie, Bonn (Germany, F.R.)). Mar 1982. 102p. (In German). NTIS (US Sales Only), PC A06/MF A01. Order Number DE82750550.

Step I of these investigations sponsored by the BMFT (Bundesminister fuer Forschung und Technologie) has been completed. The reason for the investigations were experimental and theoretical efforts to increase the collecting capacity of a tornado dust collector in preparation of the use of the tornado dust collector after pressurized fluidized-bed combustion furnace (PFBC furnace). Laboratory tests were performed for this purpose, external companies and institutes were contacted on the subject of measurement techniques at high temperatures and pressures, and a theoretical calculation of the collecting processes in the tornado dust collector was carried out as well. It was possible to prove by experiments that for example the so-called bunker extraction may reduce the clean gas dust loading by a maximum of approximately one-half under normal conditions and using the test dust H 100. Further suggestions for improvements result from the theoretical calculation or the velocity measurements performed for this purpose. From the results of the investigations performed in Phase I follows logically the subsequent implementation of Phase II with a practical use of the tornado dust collector downstream of a pressurized fluidized-bed furnace.

2767 **(ORNL/MIT—356) Transport evaluation of a gas-liquid scrubber.** Brodner, A.J.; Bistline, J.E.; Weber, S.E. (Massachusetts Inst. of Tech., Oak Ridge, TN (USA). School of Chemical Engineering Practice). Oct 1982. Contract W-7405-ENG-26. 51p. NTIS, PC A04/MF A01. Order Number DE83001680.

The hydraulics and the mass-transfer behavior of a five-tray, single-bubble-cap, single-downcomer, gas-liquid contactor were studied for use as a gas scrubber. Flooding was not observed at the maximum available liquid and gas flow rates of 0.32 and 464 L/min, respectively. The maximum liquid entrainment was 33% at a gross liquid flow rate of 0.05 L/min. The Murphree-tray efficiencies for absorption of CO_2 (5000 ppM in air) into demineralized water ranged from 0.14 to 0.74 for volumetric liquid-to-gas ratios of 4×10^{-4} and 2×10^{-4}, respectively, for k/sub L/a values ranging from 0.088 to 0.36 min^{-1}. 12 figures, 10 tables.

2768 **(PB—82-189663) Effects of surface properties of collectors on the removal of charged and uncharged particles from aerosol suspensions. Final report nov 80-sep 81.** Leong, K.H.; Stukel, J.J.; Hopke, P.K. (Advanced Environmental Control Technology Research Center, Urbana, IL (USA)). Sep 1981. 70p. NTIS, PC A04/MF A01.

The literature on the adhesion of particles impacting on solid and liquid collectors was reviewed. Different forces or mechanisms affecting collision and adhesion of particles with collectors were described. Good qualitative agreement existed between experiment and theory in the case of solid collectors, although the presence of and variation in surface asperities prevented good quantitative agreement. For liquid collectors, disagreements both theoretical and experimental abounded in the literature on the ability of such collectors to collect non or partially wettable particles. The use of charge on drops in particulate control devices has been shown to greatly enhance the collection of fine particles. However, data indicate that too high a charge may lead to a decrease in efficiencies due to Rayleigh instability of the drops and charge exchange between particles and drops. A program of experimental and modelling studies is proposed to resolve these difficulties in order to be able to optimize control of particulate emissions for fine particles.

43 PARTICLE ACCELERATORS

4301 Design, Development, And Operation

REFER ALSO TO CITATION(S) 3252, 3253, 3254, 3258

2769 (INIS-mf—7045) **Tandem Accelerator Laboratory annual report 1978.** (Democritus Nuclear Research Center, Athens (Greece)). 1979. 60p. NTIS (US Sales Only), PC A04/MF A01; Also available from Library, Democritus NRC. Order Number DE82702561.

The activities presented cover the following topics: heavy ion reactions, gamma ray spectroscopy, applied atomic and nuclear physics, theoretical nuclear physics, data collection and processing, accelerator operation, as well as personnel and publications.

2770 (INIS-mf—7046) **Tandem Accelerator Laboratory annual report 1979.** Xenoulis, A.C. (ed.). (Democritus Nuclear Research Center, Athens (Greece)). 1980. 57p. NTIS (US Sales Only), PC A04/MF A01; Also available from Library, Democritus NRC. Order Number DE82702562.

The activities presented cover the following topics: heavy ion reactions, gamma ray spectroscopy, applied atomic and nuclear physics, theoretical nuclear physics, data collection and processing, accelerator operation, as well as personnel and publications.

2771 (INIS-mf—7047) **Tandem Accelerator Laboratory annual report 1980.** Anagnostatos, G.S. (ed.). (Democritus Nuclear Research Center, Athens (Greece)). 1981. 67p. NTIS (US Sales Only), PC A04/MF A01; Also available from Library, Democritus NRC. Order Number DE82702563.

The activities presented cover the following topics: heavy ion reactions, gamma ray spectroscopy, applied atomic and nuclear physics, theoretical nuclear physics, data collection and processing development, accelerator operation, as well as personnel and publications.

2772 (INP—1069/PL, pp 106-123) **Study of characteristics of beams and specification of works performed on 120-M isochronous cyclotron.** Bejshovets, V. (Ceskoslovenska Akademie Ved, Rez. Ustav Jaderne Fyziky). 1980. (In Russian). Dep. NTIS (US Sales Only).

From International seminar on isochronous cyclotron technique; Cracow, Poland (13 Nov 1978).

Cyclotron from Dubna U-120 M has been installed in Rez, Czechoslovakia in 1976. The first beam has been obtained in 1977. Results of machine tests made during the control beam runs are reported.

2773 (INP—1069/PL, pp 124-149) **Increase of partial energy in cyclotron.** Sarkisyan, L.A. (Moskovskij Gosudarstvennyj Univ. (USSR). Nauchno-Issledovatel'skij Inst. Yadernoj Fiziki). 1980. (In Russian). Dep. NTIS (US Sales Only).

From International seminar on isochronous cyclotron technique; Cracow, Poland (13 Nov 1978).

Results of modernization of Moscow cyclotron are presented. The aim of modernization was to increase energy of beam, to make possible acceleration of heavy ions, and to increase beam current.

2774 (INP—1069/PL, pp 151-180) **Sector ring accelerator "RESATRON".** Schwabe, E. (Institute of Nuclear Physics, Krakow (Poland)). 1980. (In Russian). Dep. NTIS (US Sales Only).

From International seminar on isochronous cyclotron technique; Cracow, Poland (13 Nov 1978).

Project of sector ring accelerator RESATRON is described. The curiosity of this accelerator is the second cycle of acceleration of the beam after stripping it on the foil. In such an accelerator heavy ions with a different ratio Z to A can be accelerated.

2775 (INP—1069/PL, pp 181-196) **Some characteristics of 103 cm cyclotron.** Bogdanov, P.V.; Galaev, A.N.; Gal'chuk, A.V.; Davydov, M.S.; Krymov, E.B.; Malyshev, I.F.; Ryabova, L.A.; Stepanov, A.V.; Stogov, Yu.I. (Nauchno-Issledovatel'skij Inst. Ehlektrofizicheskoj Apparatury, Leningrad (USSR)). 1980. (In Russian). Dep. NTIS (US Sales Only).

From International seminar on isochronous cyclotron technique; Cracow, Poland (13 Nov 1978).

The compact cyclotron 103-cm is used for acceleration of ions H_1^{+1}, H_2^{+1}, He_3^{+2} and He_4^{+2}. The characteristics of the magnetic field chosen for the cyclotron are presented. The problem of orbits centring is discussed. The acceleration system as well as beam extraction are described.

2776 (JINR—P9-82-301) **MT-22 microtron.** Belov, A.G.; Bondarenko, P.G.; Shimane, Ch.; Bognar, M. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Reactions). 1982. 14p. (In Russian). Joint Inst. for Nuclear Research, Dubna, USSR.

The results of the joint work on design and construction of a microtron carried out at the Laboratory of Nuclear Reactions and the Polytechnical Institute (Prague) are presented. The design of several accelerator parts and systems, its setup, operating parameters are briefly described. The microtron is capable of accelerating electrons upto 22 MeV (maximum number of orbit-24) with beam intensity of 20 μA. The electrons accelerated are used to produce bremsstrahlung and neutron beams. The thermal neutron density at the center of graphite moderator with U-Be convertor is 6×10^8 n/s sm^2. Total yield of fast neutrons is 6×10^{11} n/s.

2777 (Juel-Conf—45, pp 53-62) **Improvements in the Rapid Cycling Synchrotron.** Potts, C.W. Oct 1981. NTIS (US Sales Only), PC A99/MF A01.

From 5. meeting of the international collaboration on advanced neutron sources; Julich, F.R. Germany (22 Jun 1981).

The Rapid Cycling Synchrotron[1] (RCS), originally designed as an injection energy booster for the Zero Gradient Synchrotron (ZGS), operated under contraints imposed by ZGS operation until December 1979. Once these restraints were removed, the RCS made rapid strides toward its nearterm goals of 8 μA of protons for Argonne National Laboratory's (ANL) Intense Pulsed Neutron Source (IPNS) program. Reliable 30 Hz operation was achieved in the spring of 1980 with beams as high as 2×10^{12} protons per pulse and weekly average intensities of over 6 μA on target. These gains resulted from better injection matching, more efficient RF turn-on and dynamic chromatricity control. A high intensity small diameter synchrotron, such as the RCS, has special problems with loss control which dictate prudence during intensity improvment activities. Additional improvements were made to the machine starting in August of 1980 while the extraction magnets were relocated for operation with the IPNS-I target. These improvements have now been completed. Startup of the accelerator is now underway, and it is clear that these modifications have resulted in a radio-actively cleaner operation. It is too early to evaluate the effects of the improvements on intensity and reliability, but a single pulse extracted intensity of 2.4×10^{12} protons has been achieved, a 20% increase. The studies and equipment leading to the intensity gains are discussed.

2778 (KFK—3228, pp 3-12) **Improvements in the rapid cycling synchrotron.** Potts, C.W. Nov 1981. Dep. NTIS (US Sales Only).

From Workshop on high intensity accelerators and compressor rings; Karlsruhe, F.R. Germany (25 Jun 1981).

The Rapid Cycling Snychrotron[1] (RCS), originally designed as an injection energy booster for the Zero Gradient Synchrotron (ZGS), operated under constraints imposed by ZGS operation until December 1979. Once these restraints were removed, the RCS made rapid strides toward its nearterm goals of 8 μA of protons for Argonne National Laboratory's (ANL) Intense Pulsed Neutron Source (IPNS) program. Reliable 30 Hz operation was achieved in the spring of 1980 with beams as high as 2×10^{12} protons per pulse and weekly average intensities of over 6 μA on target. These gains resulted from better injection matching, more efficient RF turn-on and dynamic chromaticity control. A high intensity small diameter

synchrotron, such as the RCS, has special problems with loss control which dictate prudence during intensity improvement activities. Additional improvements were made to the machine starting in August of 1980 while the extraction magnets were relocated for operation with the IPNS-I target. These improvements have now been completed. Startup of the accelerator is now underway, and it is clear that these modifications have resulted in a radioactively cleaner operation. It is too early to evaluate the effects of the improvements on intensity and reliability, but a single pulse extracted intensity of 2.4 x 10^{12} protons has been achieved, a 20% increase. The studies and equipment leading to the intensity gains are discussed.

2779 (KFTI—78-46, pp 6-8) **Multibeam accelerator on the base of the LU-2.** Artemov, V.I.; Dem'yanenko, G.K.; Mel'nichenko, V.V.; Peev, F.A. 1978. (In Russian). Dep. NTIS (US Sales Only).

In Technique of physical experiment.

The structural diagram of the accelerating focusing section of a multibeam variant of the LU-2 accelerator is suggested. The main principles of accelerator control are considered. The accelerator beam output parameters are calculated according to their designed initial values. The analysis of the results obtained shows that the multibeam variant of the 2 GeV electron linac permits parallel operation of 2-4 targets and to extend the range of carried out investigations.

2780 (UCRL—88312) **Advanced test accelerator: a high-current induction linac.** Cook, E.G.; Birx, D.L.; Reginato, L.L. (Lawrence Livermore National Lab., CA (USA)). 1 Nov 1982. Contract W-7405-ENG-48. 17p. (CONF-821123—1). NTIS, PC A02/MF A01. Order Number DE83002150.

From Conference on application of accelerator in research and industry; Denton, TX, USA (10 Nov 1982).

The Advanced Test Accelerator (ATA) is a linear induction accelerator being built at Lawrence Livermore National Laboratory. The aim of the ATA, together with its associated physics program is the research and development necessary to resolve whether particle-beam propagation is possible. Since the accelerator is the tool needed to do the basic propagation experiment, many of its design parameters are specified by the physics. The accelerator parameters are: 50 MeV, 10 kA, 70 ns pulse width (FWHM), and a 1 kHz rep-rate during a ten-pulse burst. In addition, beam quality and pulse-to-pulse repeatability must be excellent. The unique features of the accelerator are the 10 kA beam and the 1 kHz burst frequency.

2781 (BNL—31856) **Remarks to panel discussion on new machines.** Palmer, R.B. (Brookhaven National Lab., Upton, NY (USA)). [nd]. Contract AC02-76CH00016. 9p. (CONF-820718—9). NTIS, PC A02/MF A01. Order Number DE83000209.

From 21. international conference on high energy physics; Paris, France (29 Jul 1982).

The discussion centers on the energies and luminosities required to reach a 1 TeV mass scale. Several bellwether experiments are discussed, involving either momentum transfers or new classes of particles. (GHT)

4302 Beam Dynamics, Field Calculations, And Ion Optics

REFER ALSO TO CITATION(S) 2857, 2858

2782 (AD-A—111873/6) **Stability properties of an intense relativistic nonneutral electron ring in a modified betatron accelerator. Final report.** Uhm, H.S.; Davidson, R.C. (Naval Surface Weapons Center, Silver Spring, MD (USA)). Sep 1981. 53p. NTIS, PC A04/MF A01.

Equilibrium and stability properties of an intense electron ring located at the midplane of an externally applied mirror field are investigated within the framework of the linearized Vlasov-Maxwell equations, including the important influence of equilibrium self fields and an applied field in the torodial direction. It is assumed that the ring is thin and that nu/gamma(sub b) << 1, where nu is Budker's parameter and gamma(sub b)mc-squared is the characteristic electron energy. Equilibrium and stability properties are calculated for the choice of equilibrium distribution function in which all electrons have the same value of energy in a frame of reference rotating with angular velocity in the minor cross section of the ring, and a Lorentzian distribution in canonical angular momentum. Negative-mass and resistance-wall stability properties are calculated, and a closed dispersion relation is obtained for the case where the ring is located inside a toroidal conductor with finite resistivity and minor radius much less than the major radius. One of the most important features of the stability analysis is that the negative-mass instability in a high-current ring can be stabilized by equilibrium self-field effects in circumstances where the self fields are sufficiently intense. Moreover, a modest spread Delta in canonical angular momentum can stabilize the resistive-wall instability.

2783 (AD-A—111874/4) **Grad-b drift of an electron beam in the high current betatron. Final report.** Uhm, H.S. (Naval Surface Weapons Center, Silver Spring, MD (USA)). Sep 1981. 18p. NTIS, PC A02/MF A01.

The equation of motion of the center of mass coordinates for an electron beam in the high current betatron is investigated. For a small betatron field, it is shown that even for a stable single particle orbit of beam electrons, the grad-B drift velocity of the center of mass coordinates can be fractional percents of the speed of light, thereby presenting a serious difficulty in future experiments.

2784 (AD-A—113529/2) **Stability of charged beam propagation through a relativistic hollow electron beam. Final report.** Uhm, H.S. (Naval Surface Weapons Center, Silver Spring, MD (USA)). Sep 1981. 36p. NTIS, PC A03/MF A01.

Stability properties of charged beam propagation through a relativistic hollow electron beam are investigated, in connection with present experimental applications in the collective particle accelerator. The stability analysis is carried out for long axial wavelength and low-frequency perturbations. A closed algebraic dispersion relation for coupled transverse oscillations is obtained for the solid and hollow beams with sharp-boundary density profiles. One of the most important features in the analysis is that the typical growth rate of the transverse oscillation is order of the hollow beam diocotron frequency, thereby severely limiting the solid beam propagation through a relativistic hollow electron beam. However, for a solid beam with a small radius, the fundamental mode perturbation (i.e., the dipole oscillation) is the most unstable mode.

2785 (AD-A—113530/0) **The influence of a background plasma on the diocotron instability of a relativistic hollow electron beam. Final report.** Bilow, H.J.; Uhm, H.S. (Naval Surface Weapons Center, Silver Spring, MD (USA)). Sep 1981. 42p. NTIS, PC A03/MF A01.

The influence of a background plasma on the diocotron instability of a relativistic hollow electron beam is investigated within the framework of a cold fluid model. The background plasma is taken to have a uniform density except at the mean radius of the electron beam where the density is assumed to be discontinuous. Of the charged species comprising the plasma, only the electrons influence the dynamics of the beam-plasma system; the effect of the ions is negligible because of their small plasma frequency. A dispersion relation for the eigenfrequencies of the system is derived and employed to examine instabilities. It is found that the fundamental mode, which is unconditionally stable for a hollow electron beam in a vacuum, is now unstable for certain parameter regimes. The appearance or growth of instabilities with increases in the plasma density discontinuity is observed, while increases in the relativistic factor are seen to exert a stabilizing influence. It is also found that thin beams are generally more unstable than thick ones.

2786 (AD-A—113974/0) **Integer resonances in the modified betatron. Memorandum report.** Chernin, D.; Sprangle, P. (Naval Research Lab., Washington, DC (USA)). 8 Apr 1982. 24p. NTIS, PC A02/MF A01.

The integer resonances affecting beam motion in the presence of external field imperfections in the modified betatron are

studied. An upper bound is obtained on the magnitude of field error that may be tolerated. A numerical example shows that for practical parameters the resulting bound is very restrictive. The effect of longitudinal temperature and other possible stabilizing effects are discussed.

2787 **(BNL—51538) Single-beam coherent instabilities in circular accelerators and storage rings.** Pellegrini, C. (Brookhaven National Lab., Upton, NY (USA)). Apr 1982. Contract AC02-76CH00016. 70p. NTIS, PC A04/MF A01. Order Number DE83000792.

The theory of the stability of high intensity particle beams in circular accelerators and storage rings is developed. A simple one dimensional oscillator system is used to introduce the discussion of the stability problem and of the effect of a frequency distribution. These results are then extended to the case of a system of particles executing synchrotron and betatron oscillations in a circular accelerator. In the absence of a general solution of the stability problems, it is convenient to introduce a classification of the instabilities, using the characteristic times and lengths of the particle system. This allows us to identify a set of parameters of the particle beam for which one can establish the stability conditions.

2788 **(FERMILAB/TM—1132) Magnetic field calculation for Fermilab-style magnet coil end.** Ishibashi, K.; McInturff, A.D. (Fermi National Accelerator Lab., Batavia, IL (USA)). Sep 1982. Contract AC02-76CH03000. 10p. NTIS, PC A02/MF A01. Order Number DE83000620.

Portions of document are illegible.

A simple end field calculation is described, which utilizes a reciprocal theorem of mutual inductance between actual windings and a virtual coil. The calculation method is applied to a Fermilab-style magnet, and the computation results are compared with those obtained by GFUN.

2789 (INP—1069/PL, pp 219-227) **Spatial distributions of magnetic field in U-120 M isochronous cyclotron.** Alenitskij, Yu.G.; Vasilevskaya, D.P.; Zaplatin, N.L.; Ivashkevich, S.A.; Morozov, N.A.; Shishlyannikov, P.T. (Joint Inst. for Nuclear Research, Dubna (USSR)). 1980. (In Russian). Dep. NTIS (US Sales Only).

From International seminar on isochronous cyclotron technique; Cracow, Poland (13 Nov 1978).

Description of the spatial distribution of magnetic field in U-120 M isochronous cyclotron is given. Results of calculations are compared with experimental values. Problems of correction of magnetic field configuration are discussed.

2790 (INP—1069/PL, pp 228-236) **Magnetic field configuration in the isochronous cyclotron of Institute of Nuclear Physics in Alma-Ata.** Arzumanov, A.A.; Volkov, B.A.; Nigmatov, M.Kh. (AN Kazakhskoj SSR, Alma-Ata. Inst. Yadernoj Fiziki). 1980. (In Russian). Dep. NTIS (US Sales Only).

From International seminar on isochronous cyclotron technique; Cracow, Poland (13 Nov 1978).

Magnetic field configuration in the isochronous cyclotron in Kazakhstan is described. Problem of axial stability of cyclotron orbit is discussed. The most important parameters of cyclotron are given.

2791 **(IPPJ-DT—83) Adiabatic compression of electron ring.** Kobayashi, N. (Nagoya Univ. (Japan). Inst. of Plasma Physics). Jan 1981. 36p. (In Japanese). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82702564.

Fast adiabatic compression of the electron ring has been investigated with an electron ring accelerator installed at IPP Nagoya. During the compression, destruction of the ring due to a negative mass instability has been observed, but it is not consistent with the instability theory. To discuss the results, the pillbox model was applied to the metalic cylindrical vaccum chamber, and effects of self-fields of the electron ring and beam loading were introduced. Using this model, the experimental results has been explained reasonably.

2792 **(JINR—9-81-539) Study of the properties of the magnetic field of the JINR synchrophasotron and their effect on an accelerated beam.** Zabolotin, V.P.; Isaev, A.S.; Perfeev, V.N.; Fedukov, S.V.; Sherstyanov, D.I.; Tsarenkov, A.P.; Yalovoj, I.N. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of High Energy). 1981. 12p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702565.

Results are presented of studies and tuning of the magnetic field of the JINR synchrophasotron over a period of 1960-74. These studies have been performed to increase the beam capture in the acceleration mode for fields 160 and 230 Hauss and to decrease its losses while accelerating. The operating level of field inhomogeneity index is chosen (n=0.65) and it is proved experimentally that this value is optimal. Using the experimental data, the amplitude and position of a first harmonic of beam orbit distortion on the radius and vertical were calculated. An optimal correction was made at the initial stage of acceleration. This decreased the beam orbit distortion from 12-16 cm down to 5-9 cm on the radius and from 11-14 cm to 1-2.5 cm on the vertical. It is shown that the tuning of the magnetic field resulted in a significant increase of the accelerated beam intensity.

2793 **(JINR—P9-82-168) Effect of nonlinear ion space-charge forces on ion-beam parameters of collective accelerator.** Kuznetsov, A.B.; Preisendorf, V.A. (Joint Inst. for Nuclear Research, Dubna (USSR). Dept. of New Acceleration Methods). 1982. 14p. (In Russian). Joint Inst. for Nuclear Research, Dubna, USSR.

The effect of nonlinear ion space charge forces on ion beam parameters of KUTI accelerator is considered. It is shown that the effect of space charge forces of ions accumulated in the electron ring leads to increasing the transverse size of ion beam and to decrease in ion velocities in the ring. Nonlinear dependence of space charge forces results in more rapid increasing of angle dependence and in the energy spread of ion beam in the drift space as compared with linear dependence of space charge forces. The beam shape on phase plane changes and its effective emittance increases. The distribution of particles in the beam becomes more uniform to the end of the drift space and dependence of space charge forces approaches the linear one.

2794 **(JINR—P11-82-230) Simulation of ionization-front-forming process at injection of relativistic electron beam with a gas chamber.** Dolya, S.N.; Zhidkov, E.P.; Rubin, S.B.; Semerdzhiev, Kh.I. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Computing Techniques and Automation). 1982. 18p. (In Russian). Joint Inst. for Nuclear Research, Dubna, USSR.

The methodical work on creation of computer program for numerical study of the processes of forming and motion of a virtual cathode at the injection of relativistic electron beam into a short cylindrical chamber, filled with gas, has been carried out. The obtained plots of the distributions of fields, potential and density appearing out of ion and electron gas of the beam itself are presented. The dependence of cross-section ionization on the electron velocity has been taken into account at the calculation; the resonance contribution into summarized cross-section of ionization was simulated. It is shown that the injection into the chamber without gas, some oscillations of the virtual cathode are observed. At the presence of the final front of the beam, the fields level at the initial stage is smaller than for the beam with a sharp front. However, in some time the field amplitudes are compared. The motion of simulated probe ions in the chamber is analyzed.

2795 **(JINR—P11-82-233) Numerical calculation of the motion of dense electron bunch interacting with pulsed accelerating field in inhomogeneous cavity.** Bakhvalov, N.S.; Zhidkov, E.P.; Kadantseva, E.P.; Rubin, S.B.; Serdyukova, S.I. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Computing Techniques and Automation). 1982. 14p. (In Russian). Joint Inst. for Nuclear Research, Dubna, USSR.

Results of numerical calculation by the finite-differential method of self-consistent problem of the motion of dense electron bunch in inhomogeneous cavity is discussed. The pulsed strange

wave with finite storage of energy, excited secondary and induced potential fields affects the bunch. Two problems are considered: in the first case bunch flies into the cavity, in the second one at the initial moment the bunch rests in the center of cavity. The energy balance in the dynamic system, bunch plus total electromagnetic field, is considered.

2796 **(LBL—14635) Particle motion in the ELF wiggler.** Wurtele, J.S.; Sessler, A.M. (Lawrence Berkeley Lab., CA (USA)). Jun 1982. Contract AC03-76SF00098. 3p. (CONF-821203—1). NTIS, PC A02/MF A01. Order Number DE82018730.

From International conference on lasers; New Orleans, LA, USA (13 Dec 1982).

Particle motion in the ELF wiggler was investigated numerically and analytically. A transport system was designed using continuous quadrupole focusing in the wiggle plane and natural wiggle focusing in the non-wiggle plane.

4303 Auxiliaries And Components

REFER ALSO TO CITATION(S) 1833, 2709, 2775, 2856, 2862, 2867, 3405

2797 **(BNL—31396) Correlation of superconductor strand, cable and dipole critical currents in ISABELLE magnets.** Tannenbaum, M.J.; Garber, M.; Sampson, W.B. (Brookhaven National Lab., Upton, NY (USA)). 1982. Contract AC02-76CH00016. 30p. (CONF-821108—4). NTIS, PC A03/MF A01. Order Number DE83000717.

From Applied superconductivity conference; Knoxville, TN, USA (30 Nov 1982).

Portions of document are illegible.

A calibration between vendor critical current data for 0.0268″ diameter superconductor strand supplied to Fermilab, and the BNL 10^{-13} OMEGA cm critical current specification is presented. Vendor critical current data for over 400 Fermilab type billets are shown, both as supplied by the vendor and converted to BNL units. Predictions of cable critical current are made using the sum of the critical currents of the 23 strands, where all strands from the same half billet are assigned the same critical current. The measured cable critical current shows excellent correlation to the predicted value and is approximately 14 +- 2% below it. ISABELLE full length dipoles reach the conductor critical current limit, essentially without training. Magnet performance is predictable from the measured critical current of a short sample of cable to within 2%.

2798 **(BNL—31848) High power, triple grid thyratron and its test circuit.** Menown, H.; Newton, B.; Lambiase, R.F. (Brookhaven National Lab., Upton, NY (USA); English Electric Valve Co. Ltd., Chelmsford). 1982. Contract AC02-76CH00016. 4p. (CONF-820626—11). NTIS, PC A02/MF A01. Order Number DE83000212.

From 15. power modulator symposium; Baltimore, MD, USA (14 Jun 1982).

Portions of document are illegible.

As part of the polarized proton experiment on the AGS at Brookhaven National Laboratory, a requirement has arisen for a special thyratron device to switch the pulsed quadrupole magnets. The magnet drive-current waveform consists of a series of triangular pulses of alternate polarity, with amplitude increasing from 400A in the first pulse, to 2.7kA in the last pulse. Pulse rise-time is 2μs with a linear fall to a base line of about 3ms. Over 3.5 Coulombs are switched in the largest pulse. The pulse series is repeated every 2.5 seconds leading to an average switch current approaching 4A. EEV has designed a special thyratron to switch this circuit, and built a suitable test station.

2799 **(BNL—31874) Soft-x-ray and vacuum-ultraviolet beamlines at the National Synchrotron Light Source 700-MeV storage ring.** Williams, G.P.; Howells, M.R. (Brookhaven National Lab., Upton, NY (USA)). 1982. Contract AC02-76CH00016. 15p. (CONF-820839—3). NTIS, PC A02/MF A01. Order Number DE83000215.

From International conference on X-ray and VUV synchrotron radiation instrumentation; Hamburg, F.R. Germany (9 Aug 1982).

Portions of document are illegible.

We summarize the characteristics of the first beamlines which are being installed and commissioned at the National Synchrotron Light Source (NSLS) 700 MeV storage ring at Brookhaven National Laboratory. We also give a progress report as of July 1982 on the early stages of beamline alignment and operation in which particular attention is paid to the 5 beamlines which NSLS has developed. The report describes in detail a novel method for beamline alignment which is of general application.

2800 **(BNL—31947) Computing reliability from warranty.** Kao, S.C. (Brookhaven National Lab., Upton, NY (USA)). Aug 1982. Contract AC02-76CH00016. 10p. (CONF-820878—3). NTIS, PC A02/MF A01. Order Number DE83001572.

From Institute of mathematics and statistics annual meeting; Cincinnati, OH, USA (16 Aug 1982).

In the planned vacuum system of the new world's largest accelerator being built at Brookhaven National Laoratory the core consists of a great number of identical components. It is known that the vacuum system will fail if a specific number or more of the identical components which are adjacent to each other fail. The components are placed along a ring. In order to assure that the required minimum reliability of the vacuum system in a given period of time is obtained, a minimum warranty request needs to be figured out and forwarded to the manufacturer of the components. The purpose of this work is to determine this minimum warranty request.

2801 **(BNL—31989) Overview of undulators and wigglers for the NSLS.** Krinsky, S.; Thomlinson, W.; van Steenbergen, A. (Brookhaven National Lab., Upton, NY (USA)). Sep 1982. Contract AC02-76CH00016. 58p. NTIS, PC A04/MF A01. Order Number DE83001731.

This summary is designed to present to the NSLS user community the possible options for wigglers and undulators. The desire is to make it possible for every user to respond to the request by the NSLS for guidance in insertion device development so that it can best serve their scientific interests. There are many options, each with its own advantages and disadvantages, as well as certain restrictions imposed by the parameters of the NSLS storage rings. The NSLS is asking for input in two areas. First, we must decide on the instrumentation to be developed for the high field superconducting wiggler beam lines and for the hybrid permanent magnet wiggler lines. Secondly, the long-range plans for additional insertion devices are now under discussion. Choices must be made between the large number of different magnets which can be built. To facilitate user response, we provide a review of the properties of wigglers and undulators, introducing the basic concepts and defining the fundamental parameters. A detailed account of the brightness of the undulator source is presented and the insertion devices already under construction for the x-ray and VUV rings are discussed. We describe the suitability of certain proposed undulators for the generation of soft x-rays (5 to 50A), and harder x-rays (3 to 12A).

2802 **(CONF-821066—2) 1982 SNEAP report on the Oak Ridge 25-MV tandem accelerator.** Ziegler, N.F.; Richardson, E.G.; Mann, J.E.; Juras, R.C.; Jones, C.M.; Galbraith, D.M.; Biggerstaff, J.A.; Benjamin, J.A.; Alton, G.D. (Oak Ridge National Lab., TN (USA)). 29 Sep 1982. Contract W-7405-ENG-26. 3p. NTIS, PC A02/MF A01. Order Number DE83001957.

From Symposium for Northeastern; Seattle, WA, USA (6 Oct 1982).

Operation of the accelerator during the period from October 1981 to October 1982 is described. (GHT)

2803 **(FEI—1220) Stabilization of electrostatic accelerator charging belt current.** Nikitin, V.A.; Yakushev, V.P.; Byurger, V.; Probst, V. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk. Fiziko-Ehnergeticheskij Inst.). 1981. 11p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702558.

For the purpose of improving reliability and quality of electrostatic accelerator basic parameters the stabilizer of charging belt current is developed. The stabilizer consists of two units: high-voltage unit and control unit. The charging rectifier assures voltage up to 60 kV at total current load of 750 μA. For the EG- 2.5 and the EGP-10 M accelerators supply circuits of charging device with an earth screen and posAitive voltage supply the needles. t the EGP-10-1 accelerator negative charging voltage is supplied to the screens of the charging device. "Plus" of the rectifier is earthed. Charging and recharging are performed by means of brushes slipping over the internal belt side. At all accelerators the stability of charging current mean value is not worse 0.1%. The highest response of the system are obtained at the EG-2.5 accelerator for account of rectifier load by charging current and instrument resistor from 140 to 400 MOhm.

2804 **(FERMILAB/TM—1133) Design study of 50 kG/in. quadrupole magnet.** Ishibashi, K.; McInturff, A.D. (Fermi National Accelerator Lab., Batavia, IL (USA)). Sep 1982. Contract AC02-76CH03000. 20p. NTIS, PC A02/MF A01. Order Number DE83000621.

Portions of document are illegible.

A design study was made on a three-shell quadrupole magnet with an operational field gradient of 2.0 T/cm, which would represent one of the world's highest values for an accelerator quadrupole. The conductor specifications required the magnet to be cooled by 1.8K, 1 atm superfluid helium. Magnetic and mechanical considerations are described and discussed.

2805 **(FERMILAB/TM—1136) Shielding calculations for the antiproton target area.** Cossairt, J.D.; Yurista, P. (Fermi National Accelerator Lab., Batavia, IL (USA)). Sep 1982. Contract AC02-76CH03000. 29p. NTIS, PC A03/MF A01. Order Number DE83000622.

Portions of document are illegible.

Shielding calculations performed in conjunction with the design of the Fermilab antiproton target hall are summarized. The following radiological considerations were examined: soil activation, residual activity of components, and beam-on radiation. In addition, at the request of the designers, the energy deposition in the proposed graphite beam dump was examined for several targeting conditions in order to qualitatively determine its ability to survive. (WHK)

2806 **(IFVE-OEA—81-132) Synchronization of beam extraction processes with the IHEP accelerator magnetic cycle.** Elin, A.P.; Komarov, V.V.; Trofimov, N.N.; Chernous'ko, Yu.S. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov. Inst. Fiziki Vysokikh Ehnergij). 1981. 15p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702559.

Software and hardware for synchronization of the U-70 accelerator beam extraction processes with accelerator magnetic cycle are described. The construction of a general synchronization system based on the computer controlled unified modules is considered. The algorithm for the correlation of extraction with the magnetic field magnitude by means of reference B-pulse is proposed. Hardware of the synchronization system consists of four modules in the CAMAC standard. Computer control is realized by means of command decoders. The results of measurements of root-mean-square error of the magnetic field magnitude are presented. The accuracy of the correlation of extraction level with the 50 GeV field with confidence probability of 99.7% constitutes $+-5.1x10^{-4}$ at the field rise and $+-4.5x10^{-4}$ at the field drop if time count for drop is performed from the beginning of the flat-top magnetic field. For a year of testing the synchronization system has assured high accuracy of beam extraction correlation with magnetic cycle of the proton synhcrotron practically at any real accelerator situations.

2807 (INIS-mf—6819, pp 439) **Method for fabrication of 0.3-2 mm thick targets from CD_2 polyethylene powder.** Stepanenko, V.A.; Nemets, O.F.; Kozeratskaya, G.N.; Kucherin, I.N. 1981. (In Russian). NTIS (US Sales Only), PC A99/MF A01.

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

2808 (INIS-SU—125, pp 487) **Installation for studying the decay of short living radionuclides obtained at the U-240 cyclotron.** Vishnevskij, I.N.; Zheltonozhskij, V.A.; Svyato, V.P.; Trishin, V.V.; Klyuchnikov, A.A.; Mel'nikov, O.D.; Patlan', Yu.V.; Tkach, N.M.; Shidlyk, N.M. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

2809 **(JINR-R—9-81-468) Measurements of the excitation functions for the reactions of nitrogen ions with the Ni and Ti targets and the estimate of the energy gain for nitrogen ions in the accelerating column of CAHI prototype (JINR).** Sarantsev, V.P.; Tyutyunnikov, S.I. (Joint Inst. for Nuclear Research, Dubna (USSR). Dept. of New Acceleration Methods). 1981. 6p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702566.

The results of measuring the excitation functions for nitrogen ions on Ni and Ti targets obtained at U-200 cyclotron in 40-90 MeV energy range are presented. Using these data, the energy gain is determined for nitrogen ions in accelerating induction column of the prototype of collective accelerator of heavy ions. The energy gain is found to be 12 MeV per nitrogen nucleus.

2810 (Juel-Conf—45, pp 1-16) **Los Alamos National Laboratory Weapons Neutron Research Facility.** Woods, R. Oct 1981. NTIS (US Sales Only), PC A99/MF A01.

From 5. meeting of the international collaboration on advanced neutron sources; Julich, F.R. Germany (22 Jun 1981).

The Physical makeup is presented of the Weapons Neutron Research (WNR) facilitiy at the Los Alamos National Laboratory with emphasis on the critical components. The operating experience is discussed including failure modes and their subsequent resolution. The present target-moderator configuration is given and plans for development and improvements.

2811 (Juel-Conf—45, pp 21-32) **Present status and future program of KENS.** Watanabe, N.; Sasaki, H.; Ishikawa, Y.; Endoh, Y.; Inoue, K. Oct 1981. NTIS (US Sales Only), PC A99/MF A01.

From 5. meeting of the international collaboration on advanced neutron sources; Julich, F.R. Germany (22 Jun 1981).

KENS has been operated without any trouble for one year, and been open to all users in Japan from April 1981. Present paper describes present status of machine operation, research activity at KENS, spectrometers and their performances with experimental results already achieved, and future program of KENS-I' and KENS-II. KENS-I' is a project to increase the effective neutron beam intensity one order of magnitude in near future by means of the improvement of the present machine. KENS-II is a big future project which can provide hundred times higher beam intensity than KENS-I. Dicussions for it have just started.

2812 (Juel-Conf—45, pp 33-52) **Status of Argonne's Intense Pulsed Neutron Source (IPNS-I).** Carpenter, J.M. Oct 1981. NTIS (US Sales Only), PC A99/MF A01.

From 5. meeting of the international collaboration on advanced neutron sources; Julich, F.R. Germany (22 Jun 1981).

IPNS-I is approaching operational state. This report gives brief descriptions of the major components of IPNS-I, and describes the present status of each.

2813 (Juel-Conf—45, pp 63-71) **Progress report on the construction of the spallation neutron source at the Rutherford and Appleton Laboratories.** Gray, D.A. Oct 1981. NTIS (US Sales Only), PC A99/MF A01.

From 5. meeting of the international collaboration on advanced neutron sources; Julich, F.R. Germany (22 Jun 1981).

This report is an update of the report given by G. Manning at ICANS IV, KEK, in October 1980. The proceedings of that meeting give details of the specifications for the SNS and the financial and programme expectations for the project. The SNS programme is proceeding well. Although there have been delays in producing some of the equipment, these do not appear to prejudice the time-scale being aimed for.

2814 (Juel-Conf—45, pp 73-85) **Status report on the SIN spallation neutron source.** Fischer, W.E. Oct 1981. NTIS (US Sales Only), PC A99/MF A01.

From 5. meeting of the international collaboration on advanced neutron sources; Julich, F.R. Germany (22 Jun 1981).

This status report describes the general layout of the planned SIN spallation neutron source. In the description of the technical concept we emphasize the version using natural convection of the liquid metal target. In the second part of the report we discuss the neutronics, based on results of mock-up experiments. Furthermore, beam tube arrangements and proposed spectrometers are presented.

2815 (Juel-Conf—45, pp 87-88) **Final results of the German SNQ study.** Hennies, H.H. Oct 1981. NTIS (US Sales Only), PC A99/MF A01.

From 5. meeting of the international collaboration on advanced neutron sources; Julich, F.R. Germany (22 Jun 1981).

2816 (Juel-Conf—45, pp 89-96) **Research opportunities with prototype accelerators for an accelerator breeder.** Bartholomew, G.A. Oct 1981. NTIS (US Sales Only), PC A99/MF A01.

From 5. meeting of the international collaboration on advanced neutron sources; Julich, F.R. Germany (22 Jun 1981).

Three stages of the prototype cw proton accelerator required to develop a pilot accelerator breeder provide opportunities for neutron research. New spallation yield measurements at 100 MeV in Pb, together with known yields above 400 MeV confirm that the second stage device, a 70 mA 200 MeV linac, coupled to a Pb-Bi target could provide beam tube fluxes of approx. equal to 10^{15} cm^{-2} s^{-1}. The pilot breeder is visualized to be located in a nuclear energy centre whence users might enjoy reduced costs owing to shared use of the accelerators, cheaper electricity and the possibility of output heat reclammation.

2817 (Juel-Conf—45, pp 99-112) **Ultra-cold neutrons and spallation neutron sources.** Golub, R.; Boening, K. Oct 1981. NTIS (US Sales Only), PC A99/MF A01.

From 5. meeting of the international collaboration on advanced neutron sources; Julich, F.R. Germany (22 Jun 1981).

We present a brief introduction to the field of Ultran-Cold neutron (UNC) research including a review of the properties of UCN and some current and future applications. We then discuss two types of UCN source suitable for use in connection with spallation neutron sources - Doppler shifter and Superthermal UCN sources.

2818 (Juel-Conf—45, pp 133-172) **Neutrino physics at the spallation neutron source.** Zeitnitz, B. Oct 1981. NTIS (US Sales Only), PC A99/MF A01.

From 5. meeting of the international collaboration on advanced neutron sources; Julich, F.R. Germany (22 Jun 1981).

The advantages which the new high intensity neutron spallation sources will offer for neutrino physics are discussed. The experimental area planned for neutrino measurements at the SNQ (Spallations-Neutronen-Quelle) is presented. An experiment to search for neutrino oscillations $\nu_{sub}(\mu) \longleftrightarrow \nu_{sub}(e)$ is proposed.

2819 (Juel-Conf—45, pp 173-214) **Models and computational methods in the theoretical treatment of spallation neutron sources.** Armstrong, T.W.; Filges, D. Oct 1981. NTIS (US Sales Only), PC A99/MF A01.

From 5. meeting of the international collaboration on advanced neutron sources; Julich, F.R. Germany (22 Jun 1981).

The main aims of this review paper are: 1) to give an overview of the theoretical methods and physics models that are currently being applied in investigating various aspects of spallation neutron sources, 2) to illustrate the capabilities of present methodology with a few sample applications, and 3) to summarize some preliminary results of model validation studies that are in progress.

2820 (Juel-Conf—45, pp 241-257) **Radiation effects in targets and structural components of a spallation neutron source.** Jung, P. Oct 1981. NTIS (US Sales Only), PC A99/MF A01.

From 5. meeting of the international collaboration on advanced neutron sources; Julich, F.R. Germany (22 Jun 1981).

The basic effects of radiation damage on mechanical properties of metals are reviewed with special consideration of the operation conditions of high power spallation neutron sources. The possibility to use data from fast reactor experiments is discussed. Guide lines to material selection for a spallation neutron source are given with emphasis on the implications from radiation damage.

2821 (Juel-Conf—45, pp 263-265) **Session A3: Beam quality.** Taylor, A.D. Oct 1981. NTIS (US Sales Only), PC A99/MF A01.

From 5. meeting of the international collaboration on advanced neutron sources; Julich, F.R. Germany (22 Jun 1981).

2822 (Juel-Conf—45, pp 267-269) **Summary of session A4: Radiation effects in targets and structure components.** Carne, A. Oct 1981. NTIS (US Sales Only), PC A99/MF A01.

From 5. meeting of the international collaboration on advanced neutron sources; Julich, F.R. Germany (22 Jun 1981).

2823 (Juel-Conf—45, pp 271-276) **Summary of target workshop A5 on Energy deposition and cryogenic equipment.** Watanabe, N.; Boening, K. Oct 1981. NTIS (US Sales Only), PC A99/MF A01.

From 5. meeting of the international collaboration on advanced neutron sources; Julich, F.R. Germany (22 Jun 1981).

This note is a summary of the contributions and discussions at the target workshop A5 session where the energy deposition and other topics concerning cold moderator at spallation neutron source, a low temperature irradiation facility at SNQ, and ultra cold neutron sources for spallation sources were discussed.

2824 (Juel-Conf—45, pp 277-279) **Summary: Liquid metal targets.** Tschalaer, C. Oct 1981. NTIS (US Sales Only), PC A99/MF A01.

From 5. meeting of the international collaboration on advanced neutron sources; Julich, F.R. Germany (22 Jun 1981).

Published in summary form only.

2825 (Juel-Conf—45, pp 377-388) **Monte Carlo reflector studies for a pulsed neutron source.** Taylor, A.D. Oct 1981. NTIS (US Sales Only), PC A99/MF A01.

From 5. meeting of the international collaboration on advanced neutron sources; Julich, F.R. Germany (22 Jun 1981).

The neutronic properties of target-moderator-reflector-decoupler systems have been studied experimentally by many groups and bench mark comparisons have been made with Monte Carlo codes.

2826 (Juel-Conf—45, pp 389-416) **Preliminary neutronics of a reflected 'T'-shape premoderator/moderator for the Weapons Neutron Research Facility.** Russell, G.J.; Meier, M.M.; Robinson, H.; Taylor, A.D. Oct 1981. NTIS (US Sales Only), PC A99/MF A01.

From 5. meeting of the international collaboration on advanced neutron sources; Julich, F.R. Germany (22 Jun 1981).

At the Los Alamos pulsed spallation neutron source, we are developing the capability of measuring absolute neutron spectra and beam fluxes approx. $<=$ 10 eV and neutron pulse widths approx. $<=$ 0.2 eV. We utilize this capability in a development program directed toward characterizing and optimizing our source and providing basic neutronics data relevant to spallation neutron sources. We describe here the facilities being developed and show some preliminary results.

2827 (Juel-Conf—45, pp 417-444) **Relative intensities and time structure of thermal neutron leakage from various moderator-decoupler systems for a spallation neutron source.** Bauer, G.S.; Spitzer, H.; Werner, K.; Delahaye, J.P.; Taylor, A.D. Oct 1981. NTIS (US Sales Only), PC A99/MF A01.

From 5. meeting of the international collaboration on advanced neutron sources; Julich, F.R. Germany (22 Jun 1981).

Measurements were performed using the short bursts of 800 MeV protons at the CERN booster synchrotron to study the effect

of surface structure, decoupling and poisoning of moderators on the intensity and time structure of a spallation neutron source. It was found that grooves in the moderator surface can enhance the neutron leakage by almost a factor 2 for poisoned and decoupled moderators as well as for non-decoupled ones, with only a minor effects on the time structure. Also, it could be shown that Cd with a decoupling energy of only 0.4 eV can replace B_4C with a decoupling energy of 3 eV with almost no effect on the time structure. This makes it much easier to provide decoupler cooling in a real design.

2828 (Juel-Conf—45, pp 445-474) **Thermal neutron leakage and time structure measured for various target-moderator-reflector configurations for a spallation neutron source.** Bauer, G.S.; Spitzer, H.; Fischer, W.E.; Gompf, F.; Reichardt, W.; Kuechle, M. Oct 1981. NTIS (US Sales Only), PC A99/MF A01.

From 5. meeting of the international collaboration on advanced neutron sources; Julich, F.R. Germany (22 Jun 1981).

Measurements were performed at the Swiss Institute of Nuclear Research of the integrated thermal neutron leakage, the thermal neutron flux distribution and the time structure of the thermal neutron field for various configurations of target, moderator and reflector for a spallation neutron source. Among them were a cylindrical Pb-Bi-target in a D_20-tank and a slab target with a hybrid moderator configuration consisting of a D_20 half tank below and a reflected H_20 moderator above the target. The results are used to predict performance data for a spallation neutron source with 500 μs long proton pulses. Although there remains some ambiguity due to non-perfect simulation of the real situation, correction factors derived from independent measurements could be used. The effect of beam tubes in the D_20 on the thermal neutron flux was measured directly.

2829 (Juel-Conf—45, pp 475-488) **Measurement of time structure and thermal neutron spectra for various target-moderator-reflector configurations of an intensity-modulated spallation neutron source.** Bauer, G.S.; Conrad, H.M.; Spitzer, H.; Friedrich, K.; Milleret, G. Oct 1981. NTIS (US Sales Only), PC A99/MF A01.

From 5. meeting of the international collaboration on advanced neutron sources; Julich, F.R. Germany (22 Jun 1981).

Lead and uranium spallation targets have been bombarded with proton pulses of about 0.14×10^{-3} s duration at a repetition rate of 100 s^{-1} and an energy of 1.1 GeV. The spectra of neutrons thermalized in compact or grooved polyethylene moderators with lead or beryllium reflectors have been investigated. Also, the dwell-times of the neutrons in the moderator were measured. The grooved moderator gives a softer spectrum than the compact one. The same holds for the use of a beryllium reflector as compared to the lead reflector. The dwell-times of the neutrons in the polyethylene moderator depend on both the neutron energy and the target-moderator-reflector arrangement. Lead was found superior to beryllium as reflector material for an intensity modulated spallation neutron source, because it results in a better time structure without loss in peak intensity of the neutron pulses.

2830 (Juel-Conf—45, pp 489-495) **Measurement of the high energy component of the neutron spectrum from a moderated source.** Hino, Y.; Cierjacks, S.; Howe, S.D.; Rainbow, M.T.; Raupp, F.; Swinhoe, M.T.; Buth, L. Oct 1981. NTIS (US Sales Only), PC A99/MF A01.

From 5. meeting of the international collaboration on advanced neutron sources; Julich, F.R. Germany (22 Jun 1981).

The high energy component of the neutron spectrum from a moderated source has been measured by an improved method at the LNS synchrotron. The detector size of 7 cm diam. by 30 cm long NE-213 liquid scintillator was used and a FERDOR unfolding code was adopted for the spectrum data analysis. This result is compared with a previous measurement employing a smaller detector and a rectangular unfolding technique. The accuracy of the new method was tested by measuring the same high energy neutron spectrum which was measured and analyzed both by time-of-flight and by the FERDOR unfolding method.

2831 (Juel-Conf—45, pp 497-502) **Effective inbeam screening of background by choppers at a pulsed spallation neutron source.** Nuecker, N. Oct 1981. NTIS (US Sales Only), PC A99/MF A01.

From 5. meeting of the international collaboration on advanced neutron sources; Julich, F.R. Germany (22 Jun 1981).

The energy spectrum of background neutrons at a spallation neutron source extends to rather high energies. Shielding against these fast neutrons is difficult. It is proposed to fill the beam holes with a series of choppers to reduce effectively the pulsed background of fast neutrons. The effective shielding length during the proton pulse may extend up to about 4 m in a time-of-flight-spectrometer.

2832 (Juel-Conf—45, pp 503-517) **Measurements of neutron fluxes at spallation source models and bare targets.** Drueke, V.; Paul, N.; Litzow, W. Oct 1981. NTIS (US Sales Only), PC A99/MF A01.

From 5. meeting of the international collaboration on advanced neutron sources; Julich, F.R. Germany (22 Jun 1981).

Thermal and fast neutron fluxes have been measured at spallation source models and bare target configurations. Different moderators and target materials have been used. The peak values of thermal fluxes were calculated from reaction rates to $9.6\ 10^{-3}$ n/cm² s p for H_2O, $1.4\ 10^{-2}$ n/cm² s p for D_2O and for the hybrid system $9.0\ 10^{-3}$ n/cm² s p in the case of slow moderator and $1.5\ 10^{-2}$ n/cm² s p in that of fast moderator. Tungsten targets gave a 20% reduced flux, uranium targets produced by factor of 1.8 increased flux in the moderator. Fast fluxes have been measured on the surface of bare Pb and U-targets using Rh103 (n,n') reaction. All measurements will be compared with calculations in future.

2833 (Juel-Conf—45, pp 519-523) **Some neutronic aspects of solid methane moderator system.** Inoue, K.; Kiyanagi, Y.; Iwasa, H.; Jinguji, K.; Watanabe, N.; Ikeda, S.; Ishikawa, Y. Oct 1981. NTIS (US Sales Only), PC A99/MF A01.

From 5. meeting of the international collaboration on advanced neutron sources; Julich, F.R. Germany (22 Jun 1981).

Beam intensities and pulse characteristics of the cold neutrons emanating from a coupled and a decoupled solid methane moderators were measured. The result suggets the possibility of adopting a coupled solid methane moderator as a KENS cold source. The effects of the cryostat wall and the phase transition of the solid methane on the neutron spectrum are also discussed.

2834 (Juel-Conf—45, pp 525-537) **Study on UCN source for a spallation facility.** Utsuro, M.; Okumura, K.; Kawabata, Y. Oct 1981. NTIS (US Sales Only), PC A99/MF A01.

From 5. meeting of the international collaboration on advanced neutron sources; Julich, F.R. Germany (22 Jun 1981).

Results of pulsed UCN experiments with a supermirror turbine in KUR and some Monte Carlo calculations are reported. A turbine efficiency and the UCN output intensity satisfying designed values are obtained. Similar UCN experiments with a cold source at an electron linac are also carried out and compared. UCN gains by a cooled polyethylene converter are derived from the experiments. From these studies, a concept of a synchronized supermirror turbine is proposed for a spallation UCN source which can serve multi-loads uses of UCN experiments.

2835 (Juel-Conf—45, pp 539-548) **Feasibility study of a low-temperature irradiation facility at the German spallation neutron source SNQ.** Boening, K.; Golub, R. Oct 1981. NTIS (US Sales Only), PC A99/MF A01.

From 5. meeting of the international collaboration on advanced neutron sources; Julich, F.R. Germany (22 Jun 1981).

A feasibility study was performed on the possible installation of a low-temperature irradiation (LTI) facility at the projected German spallation neutron source SNQ. The LTI facility should allow the irradiation of samples at temperatures between 4.5 K and about 450 K with either thermal or fast neutrons. We first outline the scientific motivation and then describe the design features and the performance of the facility, which essentially consists of an online He refrigerator and two vertical irradiation tubes providing

two irradiation positions I and II. In position I a very clean thermal neutron flux Durchmessersub(th) approx. equal to 1 x 10^{14} cm^{-2} s^{-1} can be realized, the γ-background being dominated by the contribution from the LTIF structural material. In position II the fast neutron flux is Durchmessersub(f) approx. equal to 2 x 10^{13} cm^{-2} s^{-1} (for E > 0.1 MeV) or even more. In both cases the dominant heat production comes from the thermal neutrons. The 100 s^{-1} time structure of the SNQ represents a major for irradiations at the lowest temperatures. Other minor problems for a LTI facility at the SNQ as compared to a new reactor are the high energy neutrons, the secondary protons and some geometrical constraints. The great advantage of the SNQ lies in the very low γ-background and also in its potential of flux tailoring.

2836 (Juel-Conf—45, pp 549-573) **Liquid metal target for the German neutron source (SNQ).** Hoffmann, H.; Wild, E.; Marten, K.; Baumgaertner, E.; Piesche, M. Oct 1981. NTIS (US Sales Only), PC A99/MF A01.

From 5. meeting of the international collaboration on advanced neutron sources; Julich, F.R. Germany (22 Jun 1981).

Theoretical and experimental investigations of the global flow behavior, the velocity and temperature distributions show that a standing cylinder target can be realized. A stable free jet with only small local flow reductions near the point of coalescence could be demonstrated in H_2O- and PbBi-flow supporting a developed hollow jet theory. Two PbBi circuits are operable to study the handling of PbBi and for investigations of model and true scale test section geometries. For the horizontal curved rectangular channel target up to now only theoretical calculations have been performed. Results already proved heat removal being possible in temperature levels clearly lower than limiting values. Experiments were prepared to demonstrate the operability of this target design and to proof the flow behavior.

2837 (Juel-Conf—45, pp 575-589) **Vertical, convective spallation target at SIN.** Tschalaer, C. Oct 1981. NTIS (US Sales Only), PC A99/MF A01.

From 5. meeting of the international collaboration on advanced neutron sources; Julich, F.R. Germany (22 Jun 1981).

A new version of a spallation target for the SIN neutron source is presented. It consists of a vertical container filled with a eutectic mixture of Pb and Bi (LBE). The proton beam enters from the bottom through a window. The heat of 1 MW deposited by the beam is carried to a heat exchanger inside the LBE target by natural convection. Calculations for start-up and stationary flow of the LBE show stable thermodynamic behaviour with maximal temperatures well below 500°C. Problems of window materials and operational aspects are also discussed.

2838 (Juel-Conf—45, pp 591-610) **Some remarks concerning the use of a rotating W-target in a high power spallation neutron source.** Bauer, G.S.; Lohmann, W.; Stelzer, F. Oct 1981. NTIS (US Sales Only), PC A99/MF A01.

From 5. meeting of the international collaboration on advanced neutron sources; Julich, F.R. Germany (22 Jun 1981).

In this paper we show that a rotating target for high power spallation neutron source using tungsten as a target material can be built relatively easily and operated safely. According to experimental results we do not expect a significant disadvantage to result from the use of W instead of Pb even for the D_2O-tank of the hybrid moderator system proposed for the target station DIANE in the SNQ concept. We therefore conclude that the use of a rotating W-target is a viable backup solution for the SNQ target concept, avoiding practically all of the yet to investigate difficulties with a canned target material.

2839 (Juel-Conf—45, pp 611-619) **Remarks concerning the efficiency of a booster neutron source.** Kley, W. Oct 1981. NTIS (US Sales Only), PC A99/MF A01.

From 5. meeting of the international collaboration on advanced neutron sources; Julich, F.R. Germany (22 Jun 1981).

In the present paper criteria are defined for the comparison of the efficiency of a multiplying booster target with a non-multiplying accelerator target for different injection times and pulse widths. In order to obtain a symmetric pulse from the booster, the Effective Figure of Merit : EFM = 0.75 A, where A stands for the multiplication of the booster. It is shown that for solid state physics scattering experiments using impinging neutrons in the energy range of 0.05 <= E <= 10 eV, there exists a lower limit of one μsec for the pulse width and therefore a booster target with an amplification of A = 10, a generation time tau = 0.02 μsec, has a Figure of Merit : FM = 10 and for symmetric pulses an EFM = 7.5. For the epi-thermal energy region, an optimum slowing down flux is achieved for an effective water moderator thickness of 28 mm resulting in an energy dependent moderator pulse width: Δt approx. equal to $2/\sqrt{E}$ (μsec, E in eV). If the booster pulse is matched to the moderator response function, then the accelerator injection time t_0 approx. equal to 1/2 Δt. This leads to an energy dependent figure of merit: FM(E), that is rapidly decreasing with energy and equal to one at 50 eV.

2840 (Juel-Conf—45) **ICANS-V.** Bauer, G.S.; Filges, D. (eds.). (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.)). Oct 1981. 688p. (CONF-8106120—). NTIS (US Sales Only), PC A99/MF A01. Order Number DE82780795.

From 5. meeting of the international collaboration on advanced neutron sources; Julich, F.R. Germany (22 Jun 1981).

The papers presented were entered into the data base separately. (WHK)

2841 (KEK—80-4, pp 31-56) **Spectrometer magnets for colliding machine experiments.** Sugimoto, S. (National Lab. for High Energy Physics, Oho, Ibaraki (Japan)). Aug 1980. Dep. NTIS (US Sales Only).

From 4. TRISTAN workshop; Oho, Japan (1 May 1979).

The use of the magnetic field for spectrometers has various advantages in the study of inclusive electron-proton scattering and other high energy phenomena. The advantages are good momentum resolution, good reliability in particle identification, availability for charge state determination, and usefulness for the rejection of background. Solenoidal magnets seem to be the most popular and useful tools as general purpose apparatuses. The main reason is that the large acceptance and the uniform high field are easily obtainable. An air core toroidal magnet makes the most efficient field for produced particles, because the field is always perpendicular to the tracks. The heaviest magnet might be a split-field magnet which makes the dipole field outside a beam pipe. This magnet with a closed coil is fairly efficient, because it reduces the ampere-turns and the stray field around the beam pipe. As the results of this study, it can be said that solenoids are suitable for the central detectors, because of no dead space in azimuthal angle. This advantage is valuable to the detailed study on the final states of hadrons and electrons. A toroid of lamp shape and split-field magnets are suitable to the detection of the particles escaped from a solenoid. The combination of magnets can be used for the detection of proton fragments.

2842 (KEK—80-12) **Options for increasing the KEK linac energy for H^- injection in booster.** Grand, P. (National Lab. for High Energy Physics, Oho, Ibaraki (Japan)). Jan 1981. 29p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE82702568.

The stripping process of H^- ions for injection in the 500-MeV booster requires a higher linac injector energy than is presently available (20 MeV). For a 30-mA, ~100-μs, H^- beam pulse and 20 pulses per second, an energy of about 100 MeV is desirable. A study was carried out to assess the possibilities of attaining 100 MeV within the constraints of the existing facility.

2843 (KEK—80-14, pp 21-25) **Status of KEK-Booster Meson Facility. January, 1981.** Nagamine, K. (Tokyo Univ. (Japan)). Feb 1981. Dep. NTIS (US Sales Only).

From Workshop on high energy nuclear studies at KEK; Oho, Ibaraki, Japan (16 Dec 1980).

Since the first successful operation of superconducting muon channel in July 1980, various important progresses have been made during the first series of beam times since October 1980. This report describes summaries of the achievements concerning facility construction and experimental results utilizing, the intense pulsed muons.

2844 **(KEK—80-17) Design of the magnetic system of the 6 Tesla vertical wiggler.** Lesmond, C. (National Lab. for High Energy Physics, Oho, Ibaraki (Japan)). Mar 1981. 24p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702570.

A vertical wiggler with a central field of 6 Tesla has been designed for synchrotron radiation generation at KEK-PF. The magnetic system of the wiggler consists of three pairs of superconducting coils with iron pole pieces inserted into an iron shield. The superconducting coils are placed in an U-shaped helium casing which leaves space for the beam chamber. The 52 mm gap between the opposite coils causes a high field on the conductor and large electromagnetic forces in the central magnet, and hence the superconductor works close to its critical current. The mechanical design for holding the forces is constrained by the limited space.

2845 (KFTI—78-46, pp 68-70) **Control system for the linear accelerator of electrons with integrated microelectronic circuits.** Andreev, A.M.; Ostanin, V.A.; Simulin, A.N. (Moskovskij Inzhenerno-Fizicheskij Inst. (USSR)). 1978. (In Russian). Dep. NTIS (US Sales Only).

In Technique of physical experiment.

The control system of the 300 MeV electron linac in which the logic part of the main blocks employs the K 155 series integral microcircuits is described. The accelerator operation is controlled by the operator using a system which comprises the following blocks: switching and tuning of accelerator power supply systems, blocking, indication of blocking state. Signals from the switching and control block are transmitted to the block of contactors which feed the power supply systems and regulators with power voltage. The state of all accelerator systems is registered by the information measuring system according to the signals of appropriate sensors. The experimental model of the system is now being tested at the U-17 accelerator.

2846 **(LA-UR—82-2493) Status of the WNR/PSR at Los Alamos.** Silver, R.N. (Los Alamos National Lab., NM (USA)). 1982. Contract W-7405-ENG-36. 25p. (CONF-8206118—3). NTIS, PC A02/MF A01. Order Number DE82021759.

From 6. annual international collaboration of advanced neutron sources meeting; Argonne, IL, USA (28 Jun 1982).

Portions of document are illegible.

A proton storage ring is presently under construction at Los Alamos for initial operation in 1985 to provide the world's highest peak neutron flux for neutron scattering experiments. The operational WNR pulsed neutron source is in use for TOF instrument development and condensed matter research. Experimental results have been obtained in incoherent inelastic scattering, liquids and powder diffraction, single crystal diffraction and eV spectroscopy using nuclear resonances. Technical problems being addressed include chopper phasing, scintillator detector development, shielding and collimation. A crystal analyzer spectrometer in the constant Q configuration is being assembled. The long range plan for the WNR/PSR facility is described.

2847 **(LA-UR—82-2662) Summary of discussion session on beamline shielding considerations for spallation neutron sources.** Russell, G.J.; Meier, M.M.; Broome, T.A. (Los Alamos National Lab., NM (USA); Science Research Council, Chilton (UK). Rutherford and Appleton Labs.). 1982. Contract W-7405-ENG-36. 5p. (CONF-8206118—5). NTIS, PC A02/MF A01. Order Number DE83000646.

From 6. annual international collaboration of advanced neutron sources meeting; Argonne, IL, USA (28 Jun 1982).

Discussions on considerations and design of shielding for spallation neutron sources at accelerator facilities are summarized. (WHK)

2848 **(LA-UR—82-2681) Resonance-filtered beam spectrometer.** Brugger, R.M.; Taylor, A.D.; Olsen, C.E.; Goldstone, J.A.; Soper, A.K. (Los Alamos National Lab., NM (USA)). 1982. Contract W-7405-ENG-36. 36p. (CONF-8206118—6). NTIS, PC A03/MF A01. Order Number DE83000643.

From 6. annual international collaboration of advanced neutron sources meeting; Argonne, IL, USA (28 Jun 1982).

A new inelastic neutron scattering spectrometer which operates in the range 1 eV to 15 eV has been developed at the Los Alamos pulsed spallation source WNR. Based on a nuclear resonance filtering the beam, the concept has been tested in direct, inverted and sample geometries. A number of resonance filters have been tested to determine their effectiveness. The spectrometer is described and examples of data are presented.

2849 **(LA-UR—82-2768) Physics with a high-intensity proton accelerator below 30 GeV.** Hoffman, C.M. (Los Alamos National Lab., NM (USA)). 1982. Contract W-7405-ENG-36. 7p. (CONF-820750—2). NTIS, PC A02/MF A01. Order Number DE83000614.

From American Physical Society summer study on particle physics and future facilities; Snowmass, CO, USA (1 Jul 1982).

The types of physics that would be pursued at a high-intensity, moderate-energy proton accelerator are discussed. The discussion is drawn from the deliberations of the 30-GeV subgroup of the Fixed-Target Group at this workshop.

2850 **(PB—82-177288) Polarized tagged photons: an analysis of the differential cross section for polarized bremsstrahlung in the range of interest for a tagged photon system.** Maximon, L.C.; Ganz, E.; Aniel, T.; de Miniac, A. (National Bureau of Standards, Washington, DC (USA)). Jan 1982. 129p. (NBSIR—82-2454). NTIS, PC A07/MF A01.

The differential cross section for polarized bremsstrahlung is considered for angles and energies in the range of interest for a tagging system, and a high energy, small angle approximation for this cross section is derived.

2851 **(UCRL—88197) Survey of E-Division accelerators at the Lawrence Livermore National Laboratory.** Proctor, I.D. (Lawrence Livermore National Lab., CA (USA)). 30 Sep 1982. Contract W-7405-ENG-48. 10p. (CONF-821046—3). NTIS, PC A02/MF A01. Order Number DE83000750.

From 11. world conference of the International Nuclear Target Development Society; Seattle, WA, USA (6 Oct 1982).

Portions of document are illegible.

The Experimental Physics Division (E-Division) at the Lawrence Livermore National Laboratory conducts research in basic and applied nuclear and atomic physics and materials science. Most of the research within the Division utilizes one of three facilities: an intense 14-MeV neutron source, a 27-MeV cyclograaff (consisting of a 15-MeV cyclotron and a 6-MV tandem van de Graaff), and a 100-MeV electron linac. A brief description of each facility is presented with emphasis on the research capabilities presently available.

2852 **(BNL—31394) Critical current measurements of ISABELLE superconducting cables.** Garber, M.; Sampson, W.B.; Tannenbaum, M.J. (Brookhaven National Lab., Upton, NY (USA)). [nd]. Contract AC02-76CH00016. 19p. (CONF-821108—5). NTIS, PC A02/MF A01. Order Number DE83000716.

From Applied superconductivity conference; Knoxville, TN, USA (30 Nov 1982).

Short sample critical measurements on ISABELLE superconducting cables are described. The purpose is to provide a basis for assessing magnet performance and to provide Quality Assurance data on materials purchases. The measurements are made on 1 m samples in a dipole magnet. Voltages on the V-I curve are determined to a precision of several tenths of a microvolt. The critical current is defined as that at which rho = $1 \times 10^{-12}\Omega cm^{1}$ and is determined to a precision of 1 to 2%. Similar techniques are employed in determining the critical currents of the wires of which the cables are made. The relation between cable and wire critical currents will be discussed. It is found that well insulated, slowly ramped cables of the ISABELLE design are stable for currents up to approximately rho = $2 \times 10^{-13}\Omega cm$. The value of current corresponding to the resistivity determines the limit of magnet performance. Additional properties of the cabled conductors such as the normal state resistance and the longitudinal quench propagation velocity are also measured.

4304 Storage Rings

REFER ALSO TO CITATION(S) 2787

2853 (DESY—81-047) DORIS II/III - a 5.8 GeV e^+e^- storage ring with high luminosity. Wille, K. (Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany, F.R.)). Aug 1981. 32p. Dep. NTIS (US Sales Only), MF A01. Order Number DE82750206.

At the positron-electron storage ring DORIS, a new generation of detectors, the magnetic detector ARGUS and the improved crystal detector LENA are under construction. In addition, the attached synchrotron radiation laboratory HASYLAB came into operation last year. This triggered a study to investigate improvement possibilities for the DORIS storage ring leading to a more effective use of the new experimental facilities. The results of this study are presented here and are preceded by a brief review of DORIS history.

2854 (Juel-Conf—45, pp 17-19) Status of the Los Alamos Proton Storage Ring. Cooper, R.K.; Spalek, G. Oct 1981. NTIS (US Sales Only), PC A99/MF A01.

From 5. meeting of the international collaboration on advanced neutron sources; Julich, F.R. Germany (22 Jun 1981).

The Proton Storage Ring for the Weapons Neutron Research Facility of the Los Alamos National Laboratory is reviewed as a construction project. The current status of construction and design is outlined.

2855 (KEK—80-4, pp 57-75) e^+e^- experiments at TRISTAN. Sato, T. (National Lab. for High Energy Physics, Oho, Ibaraki (Japan)). Aug 1980. Dep. NTIS (US Sales Only).

From 4. TRISTAN workshop; Oho, Japan (1 May 1979).

The possible experiments with a positron-electron colliding machine and the detectors for these experiments are discussed. The positron-electron colliding machine at TRISTAN will start with the energy of 25 x 25 GeV. If this becomes real, the most significant thing to do with this machine should be to look for new quark flavors and new leptons. The energy of 25 GeV x 25 GeV seems to be slightly low to study the new flavors, and it is very important to increase the energy. It is well known that there will be some increase of R parameter above the thresholds of new quark flavors or new heavy leptons. For the study of these things, a detector with a good particle identifier is required. To confirm the pair production of new heavy leptons, it is necessary to detect the electrons and mouns with relatively high momenta. The investigation of the weak effects in positron-electron interaction is also interesting. The weak effects can be observed in various ways, for example, the rate counting of forward-backward asymmetry of $\mu^+ \mu^-$ pair production. The parity violating effect may be measured without any polarized beam by observing the momentum distribution of muons, pions and others. Two photon processes are the dominant background to the detection of above mentioned processes. However, the two photon processes themselves will be a new field of physics. For this purpose, the construction of forward detector are required. The examples of the detectors for the purposes mentioned in this paper are presented.

2856 (KEK—80-4, pp 97-106) Electronics and computer. Asano, Y. (National Lab. for High Energy Physics, Oho, Ibaraki (Japan)). Aug 1980. Dep. NTIS (US Sales Only).

From 4. TRISTAN workshop; Oho, Japan (1 May 1979).

The requirement for the data collection and handling system of TRISTAN is discussed. In April, 1979, the first general meeting was held at KEK to organize the workshop on the future electronics for large scale, high energy experiments. Three sub-groups were formed, and those are the Group 1 for the study of fast logics, the Group 2 for the pre-processing and temporary storage of data, and the Group 3 for the data acquisition system. The general trends of the future system are the reduction of data size and the reduction of trigger rate. The important points for processing the fast data are fast block transfer, parallel processing and pre-processing. The U.S. Fast System Design Group has proposed some features for the future system called Fastbus. The Time Projection Chamber proposed for a PEP Facility gives a typical example of the future detectors for colliding beam machines. It is a large drift chamber in a solenoidal magnetic field. The method of data processing is interesting. By extrapolating the past experiences, the requirements for the host computer for the data acquisition system can be made.

2857 (KEK—80-11) Forced vibrating system perturbed with non-linear forces. Role of closed-orbit oscillation in non-linear resonance. Takayama, K. (National Lab. for High Energy Physics, Oho, Ibaraki (Japan)). Jan 1981. 20p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702567.

We describe here how the non-linear resonance is excited by the beam-beam interaction and is enhanced by the synchrotron oscillation. We consider the case that the dispersion function in the colliding regions is a little different from zero.

2858 (KEK—80-13) Investigation of the beam-beam interaction by computer simulation, (1). One dimensional model. Takayama, K. (National Lab. for High Energy Physics, Oho, Ibaraki (Japan)). Feb 1981. 87p. NTIS (US Sales Only), PC A05/MF A01. Order Number DE82702569.

The detailed aspects of stochastic instability in one dimensional betatron oscillation are studied under the assumption that a single particle collides with a strong beam. The critical strength of the beam-beam interaction in terms of the linear tune shift, at which gross regions of the betatron phase space become unstable, is got.

44 INSTRUMENTATION

4401 Radiation Instrumentation

REFER ALSO TO CITATION(S) 1817, 1831, 2104, 2711, 2714, 2808, 2826, 2841, 2848, 2917, 2918, 3007, 3138, 3255, 3260, 3413, 3529

2859 (AD—473895/1) Operation Crossroads. Vycor glass gamma ray dosimeters. Appendix no. 20 to final report. Eicher, M.; Friedman, H. (Joint Task Force One, Washington, DC (USA)). 3 Feb 1947. 11p. NTIS, PC A02/MF A01.

A gamma ray dosimeter was developed and used on Operation Crossroads providing dosage measurements at certain selected locations on the target ships. The range of dosage measured was from 100 to 20,000 roentgens. The principle of darkening of vycor glass by gamma rays proved to be applicable for a rugged, simple dosimeter.

2860 (AD-A—113085/5) Design, fabrication, calibration, testing and satellite integration of a space-radiation dosimeter. Final report Sep 78-Dec 81. Sellers, B.; Kelliher, R.; Hanser, F.A.; Morel, P.R. (Panametrics, Inc., Waltham, MA (USA)). Dec 1981. 123p. NTIS, PC A06/MF A01.

A space-radiation dosimeter has been designed, fabricated, calibrated, tested, and integrated into a DMSP satellite payload. The dosimeter is primarily designed to measure the dose from electrons of greater than 1 MeV to greater than 10 MeV in four channels. Each channel has a different thickness aluminum dome shield over a silicon solid state detector. The solid state detector outputs are processed to provide the dose from electrons (low energy loss), the dose from protons (high energy loss), the flux of electrons, the flux of protons, and the rate of high energy ioss nuclear star events. The dosimeter was extensively calibrated with nuclear radiation sources, electron beams, and proton beams. The dosimeter also has a calibration mode in which the alpha particles from a weak source behind each detector are used to check for total detector depletion and proper operation of the electronics.

2861 (BNL—31853) High-luminosity considerations. Platner, E.D. (Brookhaven National Lab., Upton, NY (USA)). 1982. Contract AC02-76CH00016. 2p. (CONF-8206116—3). NTIS, PC A02/MF A01. Order Number DE83000214.

From Workshop on division of particles and fields of the APS; Aspen, CO, USA (28 Jun 1982).

There appears to be some controversy over how high a luminosity one can use before a variety of detector limitations impose

a practical limit. Factors leading to flux limitations for a variety of detector types are discussed, and practical considerations to extending those limits are reviewed. Also, a method of reducing the effects of pileup inherent in calorimeter use at L = 10^{33}/cm^2/sec is given.

2862 **(BNL—31854) MPS II: a tracking detector system for large high rate experiments.** Platner, E.D. (Brookhaven National Lab., Upton, NY (USA)). 1982. Contract AC02-76CH00016. 3p. (CONF-8206116—2). NTIS, PC A02/MF A01. Order Number DE83000216.

From Workshop on division of particles and fields of the APS; Aspen, CO, USA (28 Jun 1982).

The MPS II tracking detector system, developed for a variety of low cross section experiments that are only practical in a high beam rate environment, is described. It was built as a general purpose device for use in a fixed target (AGS) situation where the beam passes through all elements of the detector. The electronics is dead-timeless so that high efficiency is achieved at event rates as high as 10^6/sec/ch. This capability would allow these detectors to be used as close as 20 cm from a hadron-hadron collider at 1 Tev of luminosity up to 10^{33}/cm^2/sec. The detector is a multilayer-modular drift chamber using stereo projections to provide for 3-dimensional event reconstruction. (WHK)

2863 **(BONN-IR—79-51) Design and test of a magnetic spectrometer for particle detection up to momenta of 2.5 GeV/c.** Ruhm, W. (Bonn Univ. (Germany, F.R.). Physikalisches Inst.). Dec 1979. 131p. (In German). Dep. NTIS (US Sales Only), MF A01. Order Number DE82750209.

At the photon beam γ_1 of the Bonn 2.5 GeV electron synchroton a magnetic image spectrometer of large acceptance for the detection of charged particles with momenta up to 2.5 GeV/c was installed. The concept of this spectrometer, used for particle detection at medium and small scattering angles in photo-production experiments, is first illustrated and the calculation of the magneto-optical properties of the system, consisting of two quadrupole magnets and a dipole magnet, is described. After assembly and adjustment of the magnets according to the results of the simulation calculations performed, a floating-wire measurement was carried out in order to determine the characteristics of representation achieved. The results of this precision measurement show the installed magneto-optical system to agree with the projected one within the floating-wire measuring accuracy. They allow the calculation of the particle orbits by means of the spectrometer with an accuracy that is better than 1% for average values of the starting parameters of the spectrometer, if particle scattering effects are neglected. For particle identification, determiniation of momentum and scattering angle a detector system, establishing an angular acceptance of about 3 msr and a moment acceptance of about 11% and consisting of scintillation counters, was designed and set up for the spectrometer. To conclude with, the first successful experimental application of the spectrometer for the inclusive measurement of the reaction $\gamma d \rightarrow pX$ for γ energies up to 580 MeV is reported. This experiment is a new contribution to answering the question if there are resonant excitation levels of the deuteron. The experimental detection of such dibaryon resonance effects is important in order to understand the nucleon-nucleon interaction as well as the structure of hadrons.

2864 **(CONF-820718—11) Search for a slow-moving flux of massive magnetic monopoles.** Groom, D.E.; Loh, E.C.; Ritson, D.M. (Utah Univ., Salt Lake City (USA). Dept. of Physics; Stanford Linear Accelerator Center, CA (USA)). 1982. Contract AC03-76ER00850. 9p. NTIS, PC A02/MF A01. Order Number DE82022254.

From 21. international conference on high energy physics; Paris, France (29 Jul 1982).

A 3.2 m^2 sr detector has been used to search for slow-moving weakly-ionizing particles since the beginning of April 1982. The detector is located at a mean depth of 507 hg cm^{-2} in the Mayflower Mine, Utah. It consists of coincident pairs of plastic scintillators arranged in three layers. The sensitivity has been gradually increased so that the threshold is now at about 0.12 I/sub min/, where it should detect magnetic monopoles in the velocity range 1.4 x 10^{-4}c to 3 x 10^{-3}c. The present flux limit at this bias corresponds to an aperture-solid angle-time product of (1.0 x 10^{-11} cm^{-2}sr^{-1}s^{-1})$^{-1}$.

2865 **(CONF-821011—2) Pocket neutron REM meter.** Quam, W.; Del Duca, T.; Plake, W.; Graves, G.; DeVore, T.; Warren, J. (EG and G, Inc., Goleta, CA (USA)). 1982. Contract AC08-76NV01183. 8p. NTIS, PC A02/MF A01. Order Number DE83001184.

From IEEE nuclear science symposium; Washington, DC, USA (20 Oct 1982).

This paper describes a pocket-calculator-sized, neutron-sensitive, REM-responding personnel dosimeter that uses three tissue-equivalent cylindrical proportional counters as neutron-sensitive detectors. These are conventionally called Linear Energy Transfer (LET) counters. Miniaturized hybrid circuits are used for the linear pulse handling electronics, followed by a 256-channel ADC. A CMOS microprocessor is used to calculate REM exposure from the basic rads-tissue data supplied by the LET counters and also to provide timing and display functions. The instrument is used to continuously accumulate time in hours since reset, total counts accumulated, rads-tissue, and REM. The user can display any one of these items or a channel number (an aid in calibration) at any time. Such data are provided with a precision of +- 3% for a total exposure of 1 mREM over eight hours.

2866 **(CONF-821046—1) Vapor-deposited $^{235}UO_2$ layers for an ultra-high-sensitivity fission counter.** Adair, H.L.; Byrum, B.L.; Dailey, J.M.; Gibson, J.R. (Oak Ridge National Lab., TN (USA)). 1982. Contract W-7405-ENG-26. 23p. NTIS, PC A02/MF A01. Order Number DE83001930.

From 11. world conference of the International Nuclear Target Development Society; Seattle, WA, USA (6 Oct 1982).

Portions of document are illegible.

After evaluating the properties of uranium oxide coatings prepared by electrodeposition, painting and physical vapor deposition, the vapor deposition method was selected as being preferable for preparing coatings on aluminum electrodes having a total area of 5 m^2. The electrodes were used in an experimental fission chamber designed at the Oak Ridge National Laboratory for use as a neutron flux monitor the Clinch River Breeder Reactor. Initial testing of the Ultra-High Sensitivity Fission Counter (UHSFC) indicated that a tenfold increase in sensitivity was achieved as compared to commercially available fission counters. Techniques used in vapor coating and characterizing the $^{235}UO_2$ deposits on the large-area curved substrates are described.

2867 **(FERMILAB/TM—1129) Amplifier-discriminator for E-623 drift chambers.** Green, D.; Hansen, S. (Fermi National Accelerator Lab., Batavia, IL (USA)). Aug 1982. Contract AC02-76CH03000. 9p. NTIS, PC A02/MF A01. Order Number DE83000618.

Portions of document are illegible.

Circuits and characteristics of the amplifier-discriminator for the drift chambers in the Multi-Particle Spectrometer in the Meson Area at Fermilab are described. (WHK)

2868 **(FRNC-TH—1066) Calibration of activation detectors in a monoenergetic neutron beam. Contribution to criticality dosimetry.** Massoutie, M. (Toulouse-3 Univ., 31 (France)). May 1981. 131p. (In French). NTIS (US Sales Only), PC A07/MF A01. Order Number DE82780538.

Thesis.

Activation detectors have been calibrated for critical dosimetry applications. Measurements are made using a monoenergetic neutron flux. 14 MeV neutrons obtained par (D-T) reaction are produced by 150 kV accelerator. Neutron flux determined by different methods leads us to obtain an accuracy better than 6%. The present dosimetric system (Activation Neutron Spectrometer - SNAC) gives few informations in the (10 keV - 2 MeV) energetic range. The system has been improved and modified so that SNAC detectors must be read out by gamma spectrometer.

2869 **(GSF-S—777) GSF secondary standard laboratory for photon and beta radiation.** Eckerl, H.; Nahrstedt, U. (Gesellschaft fuer Strahlen- und Umweltforschung m.b.H. Muenchen, Neuherberg (Germany, F.R.). Inst. fuer Strahlenschutz). May 1981. 73p. (In German). Dep. NTIS (US Sales Only), MF A01. Order Number DE82750208.

The GSF secondary standard laboratory (SSDL) started operation in 1978 after two years of construction work in the radiation hall of the new biology building. The tasks of the laboratory and its instrumentation are described.

2870 **(HMI-B—361) Nuclear electronics.** Friese, T. (Hahn-Meitner-Institut fuer Kernforschung Berlin G.m.b.H. (Germany, F.R.). Bereich Datenverarbeitung und Elektronik). Sep 1981. 104p. NTIS (US Sales Only), PC A06/MF A01. Order Number DE82750657.

A short survey is given on nuclear radiation detectors and nuclear electronics. It is written for newcomers and those, who are not very familiar with this technique. Some additional information is given on typical failures in nuclear measurement systems.

2871 **(HMI-B—365) POLARIS 7000 - a measuring-point based data filing system in a computer network, including an evaluation and an accounting component for the radiation protection control system of HMI.** Scheller, N. (Hahn-Meitner-Institut fuer Kernforschung Berlin G.m.b.H. (Germany, F.R.). Bereich Datenverarbeitung und Elektronik). Nov 1981. 219p. (In German). Dep. NTIS (US Sales Only), MF A01. Order Number DE82750646.

The report describes an interactive software-system for the comfortable analysis of data, gathered by a Siemens 330 process control computer within the radiation protection control system of the HMI. The report contains, in addition to a description of a measuring-point-oriented data base a detailed presentation of the unique syntax in the whole system, of each system-component and of the interfaces to applied HMI software products like graphical system (GRAFIX) and computer network system (HMINET).

2872 (INIS-mf—6819, pp 632) **Deep level contribution in the p-n junction formation by the recoil atom technique for semiconductor detectors.** Litovchenko, P.G.; Barabash, L.I.; Kibkalo, T.I.; Lobkovskii, A.P. 1981. (In Russian). NTIS (US Sales Only), PC A99/MF A01.

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

2873 (INIS-mf—6819, pp 662) **Device for ($4\pi\beta$-γ) coincidence measurements.** Bernotas, V.I.; Kaufman, V.Z. 1981. (In Russian). NTIS (US Sales Only), PC A99/MF A01.

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

2874 (INIS-mf—6819, pp 424) **Time-of-flight spectrometer of neutrons with an energy up to 16 MeV.** Grantsev, V.I.; Dryapachenko, I.P.; Ionenko, E.I.; Kirienko, V.G.; Konfederatenko, V.I.; Nemets, O.F.; Rudenko, B.A. 1981. (In Russian). NTIS (US Sales Only), PC A99/MF A01.

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

2875 (INIS-mf—6819, pp 544) **Spectroscopy of backward Compton scattering of gamma quanta.** Mokrushin, A.D. 1981. (In Russian). NTIS (US Sales Only), PC A99/MF A01.

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

2876 (INIS-mf—6819, pp 582) **Comparison of techniques for gamma spectra correction for account of spectrometric channel instability.** Stolyarova, E.L.; Novikov, A.I.; Kovtun, Yu.L.; Solov'ev, I.B.; Srapenyants, R.A.; Chelyshev, V.A. 1981. (In Russian). NTIS (US Sales Only), PC A99/MF A01.

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

2877 (INIS-mf—6819, pp 584) **Studying the spectral sensitivity and angular resolution of a neutron detector with all-round survey.** Kadilin, V.V.; Lakina, I.Yu.; Samosadnyj, V.T.; Chaadaev, V.A. 1981. (In Russian). NTIS (US Sales Only), PC A99/MF A01.

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

2878 (INIS-mf—6819, pp 608) **Acquisition of the standard reference data in gamma spectrometry.** Vylov, Ts.; Gorozhankin, V.M.; Gromov, K.Ya.; Danilenko, V.N.; Matveev, S.V.; Nedovesov, V.G.; Stepanov, E.K.; Uchevatkin, I.F.; Khol'nov, Yu.V.; Chechev, V.P. 1981. (In Russian). NTIS (US Sales Only), PC A99/MF A01.

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

2879 (INIS-mf—6819, pp 624) **Two-dimensional γ-γ coincidence installation based on the M-6000 computer.** Voronova, N.A.; Izotov, A.L.; Petrov, S.A.; Rassadin, L.A.; Chugunov, I.N. 1981. (In Russian). NTIS (US Sales Only), PC A99/MF A01.

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

2880 (INIS-mf—6819, pp 644) **Comparative evaluation of the second cascade noise contribution into the first one in a charge-sensitive preamplifier based on a cascade circuit.** Sinitsyn, V.N.; Trusov, Yu.A. 1981. (In Russian). NTIS (US Sales Only), PC A99/MF A01.

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

2881 (INIS-mf—6819, pp 619) **New possible variant of the toroidal beta spectrometer with multiple particle deflection.** Tarantin, N.I. 1981. (In Russian). NTIS (US Sales Only), PC A99/MF A01.

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

2882 (INIS-mf—6937, pp vp) **Rem equivalent personnel neutron dosimeter for neutron energies of 1 eV to 14 MeV.** Eisen, Y.; Faermann, S.; Ovadia, E.; Shamai, Y.; Karpinowitz, Z.; Schlesinger, T. (Israel Atomic Energy Commission, Yavne. Soreq Nuclear Research Center). 1980. NTIS (US Sales Only).

From Israel Nuclear Societies joint annual meeting; Beersheba, Israel (4 Dec 1980).

2883 **(INIS-mf—7008) Optimizing a method to obtain $CaSO_4$ activated with Dy for use in thermoluminescent dosimetry.** Gonzalez M, G. (Universidad Nacional Autonoma de Mexico, Mexico City. Facultad de Quimica). 1981. 74p. (In Spanish). NTIS (US Sales Only), PC A04/MF A01. Order Number DE83780014.

Thesis.

Results obtained from experiments in optimizing the variables in the preparation of $CaSO_4$ activated with dysprosium, as phosphors to be used as low dose TL dosemeters for routine radiological protection are presented. The technique used combined those of T. Yamashita and of K. Becker. Heating 8.6 gm of $CaSO_4.H_2O$ with 0.1 mol % of Dy_2O_3 in 115 ml of concentrated H_2SO_4 to 285°C to completely evaporate the acid and placing the obtained crystals in a 600°C oven for one hour gave a TL dosimeter with a sensitivity sufficient to measure 5 mR of ^{60}Co gamma radiation and show a lineal response with this radiation in a 5 mR-$5x10^4$R interval. Fading, which appeared in the phosphor only after three weeks, was in the fourth week 4.0% and in the eighth week 6.2% with a $\sigma\Xi$=+-2.1%. The quality of the phosphor obtained and its ease of reproducibility deserves note. (author).

2884 **(INIS-mf—7171) Neutron spectrometry with the NE-213 organic scintillator detector.** da Silva, A.A. (Rio de Janeiro Univ. (Brazil). Coordenacao dos Programas de Posgraduacao de Engenharia). Dec 1980. 116p. (In Portuguese). NTIS (US Sales Only), PC A06/MF A01. Order Number DE83780015.

Thesis.

A neutron spectrometer with the NE-213 organic scintillator detector (5,08cm x 5,08cm) was mounted, tested, and calibrated at

the Argonaut Reactor Laboratory of the Instituto de Engenharia Nuclear, to measure and study spectra of available fast neutron sources. The time zero-crossover technique was employed to discriminate the pulse of neutrons and gammas. The neutron spectrum from a ^{241}Am-Be source was determined experimentally in the range 1,0 MeV to 12,0 MeV and good agreement with other researchers was obtained. (Author).

2885 (INIS-mf—7190) **Hadron identification using the transition radiation.** Goeddeke, H. (Technische Hochschule Aachen (Germany, F.R.). Mathematisch-Naturwissenschaftliche Fakultaet). 4 Dec 1979. 126p. (In German). NTIS (US Sales Only), PC A07/MF A01. Order Number DE83780016.

Thesis.

The present thesis describes the design and performance of an experiment, at which using the transition radiation the possibility of the particle discrimination (π <—> p, K) in the Lorentz factor range \ approx. equal to 500-1000 was studied. The used detector consists of 20 mylar foil stacks (in the mean 440 foils), each followed by a 1 cm thick proportional chamber (gas filling 95% Xenon and 5% methane). It is also shown from which points of view radiator materials are to be selected. The detection device for the transition radiation \-quanta, the multi-wire proportional chamber, each with 32 independent measuring channels (preamplifier, peak sense and hold amplifier, ADC) are described in their constructions, and it is explained, how a closed xenon gas cycle with continuous gas purification was successfully applied. The thesis shows how the data acquisition at the 53-beam of the CERN-SPS was performed using a microprocessor (TEXAS TM 990) controlled readout circuit. Furthermore the complete electronic calibration as well as the complicated energy calibration of the 640 measuring channels is described. The operation of a simple track recognition program, which allows a fast evaluation of about 130 000 events, is illustrated; thereby single tracks at about 90% were found and could be assigned to one kind of particles. The low reconstruction rate for multiple tracks is studied at the effective spatial resolution of the detector determined. (orig.).

2886 (INIS-SU—94, pp 392) **Dosimetry of alpha and beta particles by exoelectron emission.** Hobzova, L. 1981. NTIS (US Sales Only), PC A23/MF A01.

From International conference on defects in insulating crystals; Riga-Salaspils, USSR (18 May 1981).

2887 (INIS-SU—94, pp 384-385) **Thermoluminescent dosimetry system TELDE.** Bichev, V.R.; Gotlib, V.I.; Grube, M.M.; Grant, Z.A.; Gubatova, D.J.; Nemiro, E.A. (AN Latvijskoj SSR, Riga. Inst. Fiziki). 1981. NTIS (US Sales Only), PC A23/MF A01.

From International conference on defects in insulating crystals; Riga-Salaspils, USSR (18 May 1981).

2888 (INIS-SU—94, pp 386-387) **High dose lyoluminescence dosimetry.** Avotinsh, Yu.E.; Bichev, V.R.; Gotlib, V.I.; Dzelme, Yu.R.; Kreishmane, T.E.; Tiliks, Yu.E. (Latvijskij Gosudarstvennyj Univ., Riga (USSR)). 1981. NTIS (US Sales Only), PC A23/MF A01.

From International conference on defects in insulating crystals; Riga-Salaspils, USSR (18 May 1981).

2889 (INIS-SU—94, pp 390-391) **Properties of TL dosimeters after irradiation with heavy ions at high doses.** Hubner, K. 1981. NTIS (US Sales Only), PC A23/MF A01.

From International conference on defects in insulating crystals; Riga-Salaspils, USSR (18 May 1981).

2890 (INIS-SU—125, pp 251) **Modulation method of beta spectra measurement.** Batkin, I.S.; Berkman, M.I. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

2891 (INIS-SU—125, pp 530) **High-resolution Compton spectrometer.** Rad'ko, V.E.; Razumovskaya, I.V. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

2892 (INIS-SU—125, pp 544) **Studying the effect of light collection on the shower spectrometer resolution.** Belousov, A.S.; Vazdik, Ya.A.; Kitaev, D.F.; Malinovskij, E.I.; Samedov, V.V.; Solov'ev, Yu.V.; Stolyarova, E.L. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

2893 (INIS-SU—125, pp 545) **Calculating the light collection coefficients in a compound Cherenkov shower spectrometer module.** Belousov, A.S.; Vazdik, Ya.A.; Kitaev, D.F.; Malinovskij, E.I.; Samedov, V.V.; Solov'ev, Yu.V.; Stolyarova, E.L.; Usik, A.P. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

2894 (INIS-SU—125, pp 573) **Large-size surface barrier detectors on the base of p-silicon.** Lashaev, S.I.; Nejmark, K.N.; Solov'ev, S.M.; Soloshenkov, P.S.; Trubitsyn, Yu.V. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

2895 (INIS-SU—125, pp 573) **Silicon surface barrier detectors with junction edge protection by thermally grown oxide.** Lashaev, S.I.; Colov'ev, M.S.; Solov'ev, S.M.; Uritskij, V.Ya. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

2896 (INIS-SU—125, pp 575) **Studying the maximum of resonance scintillation detector selectivity.** Cherezov, N.K. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

2897 (INIS-SU—125, pp 509) **Accounting for the sample chemical composition during electron nuclear gamma resonance spectra processing.** Vakar, O.M.; Gruzin, P.L.; Petrikin, Yu.V. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

2898 (INIS-SU—125, pp 574) **Shaper for time fixation.** Tyurin, G.P. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

2899 (INIS-SU—125, pp 489) **Errors in determining the density of photographic emulsion blackening during beta spectrogram processing.** Abdurazakov, A.A.; Gromov, K.Ya.; Islamov, T.A.; Kononenko, G.A.; Tangabaev, A.A.; Fominykh, M.I.; Tsupko-Sitnikov, V.M.; Kholmatov, A.Kh. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

2900 (INIS-SU—125, pp 492) **Processing the results of gamma quanta two-dimensional coincidence measurements for decay scheme determination.** Erokhina, K.I.; Izotov, A.L.; Lemberg, I.Kh.; Petrov, S.A.; Rassadin, L.A.; Chugunov, I.N. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

2901 **(Juel—1740) Performance test of Spectran-F and Spectran-III computer programs for resolving the ^{137}Cs-^{110}Ag double peak in gamma-ray spectrometric analysis.** Terada, H.; Malinowski, J.; Blick, H. (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Inst. fuer Reaktorbauelemente). Sep 1981. 22p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82750573.

The performance of the computer programs (Spectran F and Spectran-III) in resolving the ^{137}Cs-sup(110m)Ag double peak at 661.6-657.7 keV in the gamma-ray spectrum was investigated. In the experiments, the intensity ratios of both lines in the double peak were varied from 0.1 to 60. The results obtained show, that both programs have almost the same performance in resolving the double peak investigated, with slight superiority of Spectran-F. If accuracy better than 5% is desired, the peak intensity ratio in the dublet must be kept below 10.

2902 **(KFK—3212) Four-circle-diffractometer P110/FR2 for neutron diffraction investigations on single crystals.** Guth, H.; Paulus, H.; Heger, G.; Massing, S.; Reimers, W. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Angewandte Kernphysik 1). Aug 1981. 22p. (In German). Dep. NTIS (US Sales Only), MF A01. Order Number DE82750207.

For solid state research detailed informations about crystal structure and magnetic ordering are important. In many cases the relevant data can be obtained only by neutron diffraction. For these measurements today, automatic four circle diffractometers are used. The four circle diffractometer P110, presented here, was installed at the FR2 in 1976 and went on since with good results. In connection with the decommissioning of the FR2, the instrument will be transferred to Saclay at the end of 1981. The experimental facilities important for the user are presented; i.e. the instrumental design, the control software and auxiliary equipments for the variation of the sample temperature are described.

2903 **(LA-UR—82-2980) New generation of radiacs: small computerized multipurpose radiation monitors.** Umbarger, C.J.; Bjarke, G.O.; Erkkila, B.H.; Trujillo, F.; Waechter, D.A.; Wolf, M.A. (Los Alamos National Lab., NM (USA)). 1982. Contract W-7405-ENG-36. 8p. (CONF-821011—4). NTIS, PC A02/MF A01. Order Number DE83002084.

From IEEE nuclear science symposium; Washington, DC, USA (20 Oct 1982).

The Health Division at Los Alamos has developed a multipurpose radiation monitoring device that is computer-controlled, light weight (3 lb), includes multiple radiation detectors running simultaneously, and is simple to use. This multipurpose radiac is generic in nature and can use any of the standard radiation detectors such as NaI, ^{3}He, LET proportional gas counters, solid state surface barrier detectors, etc. LCD displays indicate the various radiation parameters in both alphanumeric and graphics format. Internal batteries allow 100 hours of use.

2904 **(LA-UR—82-2981) Portable neutron spectrometer/dosimeter.** Waechter, D.A.; Erkkila, B.H.; Vasilik, D.G. (Los Alamos National Lab., NM (USA)). 1982. Contract W-7405-ENG-36. 7p. (CONF-821011—5). NTIS, PC A02/MF A01. Order Number DE83002083.

From IEEE nuclear science symposium; Washington, DC, USA (20 Oct 1982).

Portions of document are illegible.

As part of the continuing DOE effort to upgrade personnel neutron dosimetry, the Health Division at Los Alamos has developed a portable, battery-operated, computerized neutron spectrometer/dosimeter. The instrument has a built-in tissue-equivalent LET neutron detector, 128-channel pulse height analyzer with integral liquid crystal display, and a microcomputer system which calculates dose and dose rate from neutrons incident on the detector. The neutron spectrometer/dosimeter is designed around a linear energy transfer (LET) proportional counter. The instrument will, at the user's option, display a raw data spectrum or a spectrum of rad or rem as a function of keV per micron of equivalent tissue. The dosimeter will also calculate and display accumulated dose in millirad and millirem, as well as giving the user neutron dose rates in millirad and millirem per hour.

2905 **(LBL—14114) Imaging performance of a multiwire proportional-chamber positron camera.** Perez-Mendez, V.; Del Guerra, A.; Nelson, W.R.; Tam, K.C. (Lawrence Berkeley Lab., CA (USA); California Univ., San Francisco (USA). Dept. of Radiology; Stanford Linear Accelerator Center, CA (USA); General Electric Co., Schenectady, NY (USA)). Aug 1982. Contract AC03-76SF00098. 10p. (CONF-821029—3). NTIS, PC A02/MF A01. Order Number DE83000496.

From IEEE Computer Society international symposium on medical imaging and image interpretation; Berlin, F.R. Germany (26 Oct 1982).

Portions of document are illegible.

A new design - fully three-dimensional - Positron Camera is presented, made of six MultiWire Proportional Chamber modules arranged to form the lateral surface of a hexagonal prism. A true coincidence rate of 56000 c/s is expected with an equal accidental rate for a 400 μCi activity uniformly distributed in a $\sim$ 3 l water phantom. A detailed Monte Carlo program has been used to investigate the dependence of the spatial resolution on the geometrical and physical parameters. A spatial resolution of 4.8 mm FWHM has been obtained for a ^{18}F point-like source in a 10 cm radius water phantom. The main properties of the limited angle reconstruction algorithms are described in relation to the proposed detector geometry.

2906 **(PNL—3736) Hanford personnel dosimeter supporting studies FY-1981.** (Pacific Northwest Lab., Richland, WA (USA)). Aug 1982. Contract AC06-76RL01830. 286p. NTIS, PC A13/MF A01. Order Number DE83000881.

This report examined specific functional components of the routine external personnel dosimeter program at Hanford. Components studied included: dosimeter readout; dosimeter calibration; dosimeter field response; dose calibration algorithm; dosimeter design; and TLD chip acceptance procedures. Additional information is also presented regarding the dosimeter response to light- and medium-filtered x-rays, high energy photons and neutrons. This study was conducted to clarify certain data obtained during the FY-1980 studies.

2907 (PNL—3736, pp 2.1-2.26) **Study 1: dependence of dose calculation algorithm on reader characteristics.** Hobbs, J.M.; Davis, S.A.; Fix, J.J. Aug 1982. NTIS, PC A13/MF A01.

In Hanford personnel dosimeter supporting studies FY-1981.

A study of the dependence of dose calculation algorithms on several reader operating characteristics was conducted. Reader parameters such as variable light pipe efficiencies, reader gain shifts, heater contact, and readout cycle were included in this study. Information from Hanford Reader 2 provided the majority of the data used in the study. A brief discussion of the differences between Hanford Readers 2 and 3 is provided in the text.

2908 (PNL—3736, pp 3.1-3.A.4) **Study 2: assessment of existing and proposed dosimeter calibration techniques.** Roberson, P.L.; Holbrook, K.L.; Yoder, R.C. Aug 1982. NTIS, PC A13/MF A01.

In Hanford personnel dosimeter supporting studies FY-1981.

The Hanford dosimeter response to selected beta, photon and neutron irradiations was compared using existing calibration techniques and those utilized in the draft standard for dosimeter performance BSR N13.11. In addition, alternate calibration techniques were developed to improve the shallow dose response of the Hanford dosimeters to x-rays.

2909 (PNL—3736, pp 7.1-7.E.2) **Study 6: dosimeter modification and testing.** Thorson, M.R.; Endres, G.W.R. Aug 1982. NTIS, PC A13/MF A01.

In Hanford personnel dosimeter supporting studies FY-1981.

Modifications to the design and readout of the Hanford multipurpose dosimeter to allow improved dose assessment were recommended in the Hanford Personnel Dosimeter Supporting Studies FY-1980 document (Fix et al. 1981). This study documents the effects of several modifications. Primary emphasis was on neutron dosimetry improvements which could be realized without losing the beta-gamma capabilities of the Hanford multipurpose dosimeter.

2910 (PNL—3736, pp 8.1-8.B.1) **Study 8: dosimeter annealing, sensitization and screening.** Holbrook, K.L.; Endres, G.W.R.; Davis, S.A.; Eichner, F.N. Aug 1982. NTIS, PC A13/MF A01.

In Hanford personnel dosimeter supporting studies FY-1981.

The reader annealing process was examined along with other factors affecting dosimeter sensitivity. Buildup in unannealed traps was found to be a major contributor to sensitivity differences among Hanford calibration and personnel pool dosimeters. A correction factor was developed to account for increased sensitivity when dosimeters are read soon after irradiation; however, a similar investigation failed to reveal an effect for short anneal-to-irradiation times. Screening procedures for TLDs entering the Hanford system, which provide a baseline for dosimeter sensitivity, are discussed.

2911 **(PTB-FMRB—85) Sensitivity of Makrofol fission track detectors.** Dietz, E.; Rassl, G. (Physikalisch-Technische Bundesanstalt, Braunschweig (Germany, F.R.). Forschungs- und Messreaktor). Aug 1981. 30p. (In German). Dep. NTIS (US Sales Only), MF A01. Order Number DE82750524.

Neutron fluence can be determined by means of fission track detectors consisting of fission foils in contact with suitable dielectrics (Makrofol E plastic was used in this case). Fission fragments emitted from the fissionable material into the plastic sheet generate permanent damage trails which can be made visible by an etching process. These tracks are then counted by means of an optical microscope or other methods and the number of tracks is proportional to the neutron fluence. The efficiency is defined as the ration of the number of tracks counted to the number of fissions in the fissionable layer. It is calculated from the mean range of the fission products in the fissionable material and in the plastic. The loss of very flat tracks with a small penetration angle caused by etching a certain bulk layer from the plastic foil is also taken into account. The formulas for the efficiency are deduced for thin fission layers and for thick fission foils. These calculations are made on the basis of the experimentally confirmed assumption that the ratio V of the track etching rate to the bulk etching rate is at least equal to 200. These high values for this ratio V are valid if an adequate period (several days) of oxygen influence to the damage trails is guaranteed. The calculated values of the efficiency are compared with experimental values and the uncertainty is discussed.

2912 **(RFP—3391) Personal neutron dosimeter.** Tyree, W.H.; Falk, R.B. (Rockwell International Corp., Golden, CO (USA). Rocky Flats Plant). 9 Oct 1982. Contract AC04-76DP03533. 8p. NTIS, PC A02/MF A01. Order Number DE83001327.

A personal electronic neutron dose equivalent meter includes a neutron proton converter for providing an electrical signal having a magnitude proportional to the energy of a detected proton produced from the converter, a pulse generator circuit for generating a pulse having a duration controlled by the weighted effect of the amplitude of the electrical signal, an oscillator enabled by the pulse for generating a train of clock pulses for a longer time dependent upon the pulse length, a counter for counting the clock pulses, and an indicator for providing a direct reading and aural alarm when the count indicates that the wearer has been exposed to a selected level of neutron dose equivalent. Data are included that describe the development of the hybrid circuits, electrical performance, background radiation response, gamma response, and neutron response from a Californium-252 source.

2913 **(UCRL—87588) Passive neutron-multiplication measurements.** Zolnay, A.S.; Barnett, C.S.; Spracklen, H.P. (Lawrence Livermore National Lab., CA (USA)). 14 Oct 1982. Contract W-7405-ENG-48. 5p. (CONF-821011—12). NTIS, PC A02/MF A01. Order Number DE83001620.

From IEEE nuclear science symposium; Washington, DC, USA (20 Oct 1982).

We have developed an instrument to measure neutron multiplication by statistical analysis of the timing of neutrons emitted from fissionable material. This instrument is capable of repeated analysis of the same recorded data with selected algorithms, graphical displays showing statistical properties of the data, and preservation of raw data on disk for future comparisons. In our measurements we have made a comparison of the covariance to mean and Feynman variance to mean analysis algorithms to show that the covariance avoids a bias term and measures directly the effect due to the presence of neutron chains. A spherical assembly of enriched uranium shells and acrylic resin reflector/moderator components used for the measurements is described. Preliminary experimental results of the Feynman variance to mean measurements show the expected correlation with assembly multiplication.

2914 **Review of the results of the comprehensive intercomparison 1978.** pp 181-228 of High-dose measurements in industrial radiation processing. Report of an advisory group meeting on standardization and high-dose intercomparison for industrial processing organized by the IAEA and held in Vienna, 25-29 September 1978. Vienna, Austria; International Atomic Energy Agency (1981).

From IAEA meeting on standardization and highdose intercomparison for industrial radiation processing; Vienna, Austria (25 Sep 1978).

According to the IAEA high-dose standardization and intercomparison programme, a comprehensive intercomparison was made of four promising dose meter systems. Three of the dose meter systems were given radiation doses in the 'medium' range, 1 to 10kGy (0.1 to 1Mrad) and in the 'high' range, 5 to 100kGy (0.5 to 10Mrad). The fourth dose meter system was used in a limited portion of the 'high' range, namely 5 to 50kGy (0.5 to 5Mrad). The following dose meter systems were intercompared: 1. D-alanine using ESR analysis. This system appears to give approximately correct dose interpretations, with a tendency to be slightly high at the high doses (>40 kGy). 2. Ethanol-chlorobenzene using high-frequency oscillometric analysis. The dose interpretation generally appears somewhat high especially at doses less than 10kGy. There is a relatively high degree of scatter. 3. Radiochromic dye films using a commercial optical density reader for analysis. There appears to be a trend in which the smallest doses (<5kGy) are read somewhat too high and those in the middle of the high dose range (40 to 60kGy) somewhat too low. 4. Ceric-cerous sulphate solution using electropotentiometric analysis. Only the high dose range was interpreted with apparently best results at doses exceeding 10kGy, although these have slightly high values.

2915 **Radon measurements: national needs and the role of NBS. Final report.** Colle, R. *Transactions of the American Nuclear Society;* 39: 84-86(1981).

This summary briefly highlights the existing state of services required to support the measurement of radon and related quantities, and describes the need for readily available measurement standards, calibration services, and measurement assurance mechanisms.

4402 Radiation Effects On Instrument Components, Instruments, Or Electronic Systems

REFER ALSO TO CITATION(S) 1964, 3146

2916 **(AD-A—113174/7) Attenuation and scattering of light in optical fibers-effects of nuclear radiation (modulation and display of laser radiation). Final technical report 1 May 77-30 Apr 80.** Mitra, S.S. (Rhode Island Univ., Kingston (USA). Dept. of Electrical Engineering). Dec 1981. 95p. NTIS, PC A05/MF A01.

This study consists of measurements of effects of nuclear radiation on attenuation and pulse dispersion and light scattering in optical fibers. The radiation induced attenuation in a number of optical fibers was evaluated. Several different types of fibers were exposed to steady state nuclear radiation and the resulting decrease in transmitted power was monitored as a function of wavelength and radiation dose. The wavelengths examined were in the visible and near IR regions that are of specific interest for optical fiber communications. The fibers showed a decrease in transmitted power at all wavelengths examined. The radiation sensitivity in glass core fibers was observed to show dependence on factors such as impurity content and the index modifying dopants in the fiber. Experimental measurements of neutron radiation induced pulse dispersion

changes, and attenuation changes in a 100 micron core step index fiber were made. In the course of irradiation pulse dispersion in the fiber was observed to decrease while the attenuation increased. Results indicate greater decreases in the transmission of higher order modes. This reflects the fact that the radiation response of a fiber is determined by the respective refractive indices and absorption coefficients of both the core and cladding of the fiber. Results are presented along with a discussion of mechanisms by which dispersion changes can occur in irradiated fibers.

2917 (INIS-SU—125, pp 480) **Li-drifted Si detectors sensitive volume increase under irradiation by electrons with energy of 0.6-2.5 MeV.** Kojfman, A.I.; Yaparova, N.R.; Yafasov, A.Ya. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

2918 (INIS-SU—125, pp 481) **Effect of ^{60}Co gamma radiation large doses on parameters of Li-drifted Si p-i-n detectors.** Kojfman, A.I.; Muminov, R.A.; Yaparova, N.R. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

4403 Miscellaneous Instruments

REFER ALSO TO CITATION(S) 2019

2919 (INIS-mf—6819, pp 421) **Two-arm time-of-flight mass spectrometer.** Valtsog, D.; Dmitriev, V.D.; Zajdel', V.; Zodan, Kh.; Kalinin, A.M.; Luk'yanov, S.M.; Manfrass, P.; Penionzhkevich, Yu.E.; Stari, F. 1981. (In Russian). NTIS (US Sales Only), PC A99/MF A01.

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

2920 (INIS-SU—125, pp 472) **Precise converter with new principle of analog-to-digital coding.** Andreev, E.A.; Basenko, V.K.; Kosharskij, K.G.; Pshenichnyj, S.A.; Skopyuk, M.I.; Sit'ko, S.P.; Shevchenko, V.A. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

2921 (LBL—14739) **Calibration of a photometer for measurement of the cosmic microwave background.** Bonomo, J.L.; Peterson, J.B.; Richards, P.L.; Timusk, T. (Lawrence Berkeley Lab., CA (USA); McMaster Univ., Hamilton, Ontario (Canada). Dept. of Physics). Jul 1982. Contract AC03-76SF00098. 25p. (CONF-820752—1). NTIS, PC A02/MF A01. Order Number DE83001361.

From Gamow cosmology summer school; Varenna, Italy (13 Jul 1982).

Portions of document are illegible.

In this paper we describe the calibration of a photometer designed to measure the cosmic microwave background radiation in the frequency range from 3 to 10 cm^{-1}. The general problem of absolute calibration for such measurements is discussed. The design of a new experiment which is different in most important respects from the Woody-Richards experimentis then presented. A mathematical model of the calibration procedure is developed which includes an analysis of ways in which the procedure can fail to give accurate results.

2922 (PB—82-195009) **Performance evaluation of rf electric and magnetic field measuring instruments. Final report.** Nesmith, B.C.W.; Ruggera, P.S. (Bureau of Radiological Health, Rockville, MD (USA)). Mar 1982. 36p. NTIS, PC A03/MF A01.

The need to quantify the electromagnetic fields emitted by industrial, scientific, or medical (ISM) products operating in the 10 to 300 MHz region requires the testing of instrumentation suitable for use in RF radiation hazard surveys. To meet this requirement, several procedures were devised to test the accuracy of the RF survey instrumentation. Measurement systems and protocols were developed and evaluated. The electric (E) and magnetic (H) field measuring instruments were tested for linearity, calibration accuracy, amplitude modulation response, directivity, antenna patterns, temperature response, drift and noise, Radiofrequency Interference (RFI), and polarization response. Tests were performed on three commercially available RF survey instruments and a one-of-a-kind device over the 10 to 100 MHz region. Complete tests were only performed at the ISM frequency of 27.12 MHz. Errors for each of the tests are presented in tabular form.

2923 (RFP—3380) **In-place calibration of moisture monitors.** Thompson, R.L.; Griffin, D.M. (Rockwell International Corp., Golden, CO (USA). Rocky Flats Plant). 30 Sep 1982. Contract AC04-76DP03533. 11p. NTIS, PC A02/MF A01. Order Number DE83001103.

An inexpensive, relatively quick calibration technique, used to calibrate moisture measuring instruments in Rocky Flats process lines is described. The moisture monitors utilize electrolytic cells to continuously monitor the moisture content of argon supply gases. The new method decreases the required down time of the measuring instrument from days to hours.

2924 (UCID—19466) **Response tests of a sputtered gage pressure transducer.** McCauley, E.W.; Shay, W.M. Jr.; Filler, W.S.; Aronson, P.M. (Lawrence Livermore National Lab., CA (USA)). Sep 1982. Contract W-7405-ENG-48. 62p. NTIS, PC A04/MF A01. Order Number DE83001541.

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This report describes procedures used and findings derived from a short term experimental investigation made into the dynamic response characteristics of the CEC 1000 sputtered gage pressure transducer. These transducers feature a narrow diameter, integral, reentrant tube in front of the gaged diaphram. The study was done in two parts. The first used a conventional shock tube under conditions of an initial static He gas pressure of 20 psi and applied a step pressure of about 60 psi. Two resonant frequencies, at about 1.8 kHz and 11 kHz, were observed. The second study used a shockless pressure-step generator. In this, both He gas filling and water filling of the transducer's reentrant tube were employed. Initial static pressure was 10 psi. Step pressures of 30, 60, and 90 psi were applied. Under gas-filled conditions, the resonant frequencies were found to be about 1.4 kHz and 11 kHz. Under water-filled conditions, the low resonance decreased to a range of about 0.7 to 1.1 kHz. Damping essentially eliminated the high frequency resonance.

2925 (ZfK—469) **Perspectives and possibilities for solid state physics investigations at the pulsed reactor IBR-2 of the JINR Dubna.** Feldmann, K.; Frauenheim, T.; Lauckner, J.; Weniger, J.; Muehle, E. (Zentralinstitut fuer Kernforschung, Rossendorf bei Dresden (German Democratic Republic)). Feb 1982. 33p. (In German). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82702994.

Three time-of-flight spectrometers (spectrometer of high resolution NSWR, spectrometer of inverted geometry KDSOG and spectrometer of polarized neutrons SPN-1) are presented, which will be working at the pulsed IBR-2 reactor of the JINR Dubna. Considering the parameters and the special methods of measurement of these spectrometers, the possibilities of their applications for the investigations of structural, magnetic and electronic properties of solids by means of elastic, inelastic and quasielastic neutron scattering are discussed.

2926 **In situ optical particle counter for submicron particles.** Holve, D.J. (Sandia National Laboratory, Livermore, CA). *American Institute of Aeronautics and Astronautics Monographs;* No. 82-0237, 1-8(Jan 1982). (CONF-820106—).

From 20. aerospace science conference; Orlando, FL, USA (11 Jan 1982).

The present study is the fourth in a series of investigations related to the development of an in situ single particle counting technique using an intensity deconvolution method (SPC/ID). The study is concerned with the extension of the SPC/ID technique to submicron size measurements at high number densities. A description is provided of general user requirements which directly influ-

ence the design of an SPC instrument. Experimental results are presented for monodisperse aerosols in the size range from 0.26 to 4.0 micrometers. The results are compared with Mie theory calculations of the amplitude response function. A test of the technique is conducted by measuring the absolute frequency distribution of a commercial submicron oil droplet atomizer using both the SPC/ID method and two conventional sampling instruments. The test confirms the accuracy of the SPC/ID technique for in situ measurements.

45 EXPLOSIONS AND EXPLOSIVES

4501 Chemical

REFER ALSO TO CITATION(S) 2939

2927 **(AD-A—112105/2) Surface waves from underground explosions with spall: analysis of elastic and nonlinear source models.** Day, S.M.; Rimer, N.; Cherry, J.T. (Systems, Science and Software, La Jolla, CA (USA)). Oct 1981. 40p. (SSS-R—82-5212). NTIS, PC A03/MF A01.

Anomalous surface wave observations from underground explosions have been widely attributed to the phenomenon of spall, i.e., the detachment and subsequent slapdown of near-surface layers in response to explosion-induced tensile stresses. We argue, on the basis of a simple equivalent-force model, that, while spall can enhance explosion surface waves at very short periods, it cannot contribute significantly to the teleseismic surface waves radiated by underground explosions at periods exceeding about 10 seconds. Previous theoretical results to the contrary are in error, having been based on source models which do not conserve momentum. A nonlinear, two-dimensional (axisymmetric) finite difference simulation of a buried explosion in granite further supports the conclusion that spall cannot contribute to long-period surface waves. The simulation exhibits extensive spall; nonetheless, predicted fundamental mode Rayleigh wave spectra are nearly identical to those obtained from a spherically symmetric simulation (which does not include spall), at periods exceeding about 10 seconds. At shorter periods, the two-dimensional simulation predicts some Rayleigh wave enhancement, compared to the one-dimensional simulation. The maximum enhancement, compared to the one-dimensional simulation. The maximum enhancement, about a factor of 2, occurs at a period of approximately 2.5 seconds. Synthetic long-period Rayleigh wave seismograms, at 3000 km range, show no perceptible phase or amplitude anomalies due to spall. These results are in excellent agreement with the predictions of the equivalent-force model.

2928 **(MHSMP—82-33) Mallet impact test. Final report.** West, G.T. (Mason and Hanger-Silas Mason Co., Inc., Amarillo, TX (USA)). Sep 1982. Contract AC04-76DP00487. 14p. NTIS, PC A02/MF A01. Order Number DE83001841.

Small and large scale apparatus were constructed to mechanically-simulate forces and durations measured on instrumented mallets during lathe centering operations using mock explosive billets. Tests were conducted on LX-10 samples. In addition to normal mallet impacts, simulation of glancing blows was attempted. There were no detectable reactions of the LX-10, although the simulated glancing blows were conducted at force levels high enough to melt the plastic hammer tip. These levels are considered much higher than those within a human's capability. It is concluded that the probability of LX-10 initiation as a result of an operator mallet blow is very unlikely.

2929 **(MHSMP—82-34) Skin sensitivity of large-scale sensitive pole billets.** Crutchmer, J.A. (Mason and Hanger-Silas Mason Co., Inc., Amarillo, TX (USA)). Sep 1982. Contract AC04-76DP00487. 11p. NTIS, PC A02/MF A01. Order Number DE83001802.

Skid sensitivites were determined for large-scale sensitive pole billets of several standard explosives. These included 32-kg billets of PBX 9407, 136-kg billets of PBX 9502 and 57-kg billets of PBX 9404, PBX 9501, LX-10, LX-14 and TNT. These tests showed a significant increase in skid sensitivity, i.e., lower critical heights, compared to standard 11-kg billets, with the exception of PBX 9502 which was unreactive at the highest height investigated (6.1 metres).

2930 **(MHSMP—82-37) Sparger-aminated TATB progress report.** Locke, J.G.; Ashcraft, R.W. (Mason and Hanger-Silas Mason Co., Inc., Amarillo, TX (USA)). Oct 1982. Contract AC04-76DP00487. 7p. NTIS, PC A02/MF A01. Order Number DE83001801.

The effect of processing variables on the particle size of TATB produced during sparger amination of trichlorotrinitrobenzene (TCTNB) was investigated. Factorial analyses indicate that TATB particle size decreases with increased ammonia flow rates and the presence of water (10 volume %) in the toluene amination solvent. Agitator speed showed little effect over the 100 to 200 RPM range and any TCTNB concentration effects were overshadowed by sparger plugging at high TCTNB concentrations.

2931 **(MHSMP—82-38) Evaluation of LX-17 made from water-aminated TATB.** Osborn, A.G. (Mason and Hanger-Silas Mason Co., Inc., Amarillo, TX (USA)). Oct 1982. Contract AC04-76DP00487. 16p. NTIS, PC A02/MF A01. Order Number DE83001842.

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Water-aminated TATB was formulated into LX-17 at both Pantex and Holston. Mechanical properties, growth, pressed density, corner turning and gap sensitivity properties were compared. Mechanical properties, corner turning and gap sensitivity were similar to those of LX-17 made from dry-aminated TATB. Permanent expansion resulting from thermal aging may be slightly greater than that of LX-17 with dry-aminated TATB.

2932 **(SAND—81-2173) Shock initiation in heterogeneous explosives.** Nunziato, J.W.; Kipp, M.E.; Setchell, R.E.; Walsh, E.K. (Sandia National Labs., Albuquerque, NM (USA)). Sep 1982. Contract AC04-76DP00789. 58p. NTIS, PC A04/MF A01. Order Number DE83002190.

Portions of document are illegible.

It is generally accepted that the shock initiation of heterogeneous explosives begins with the formation of hot spots in the vicinity of microstructural defects such as voids, grain boundaries, and phase boundaries where there can be significant localized deformation as a result of material viscosity, plastic work, and intergranular friction. In this report, we describe this phenomenon in the context of a recently developed theory of chemically reacting, multiphase mixtures. In particular, we consider a granular explosive with an energetic binder (e.g. PBX-9404) and represent it as a three-phase, saturated mixture consisting of the granular reactant, the binder phase, and the product gases. Under dynamic loading, viscous dissipation results in high temperatures in the binder phase which subsequently thermally explodes to form product gases. Decomposition of the granular reactant is achieved by laminar grain burning. This model has been incorporated into a 1-D Lagrangian finite-difference code (WONDY) and the evolution of compressive shock and acceleration (ramp) waves have been calculated for PBX-9404. The calculated wave growth at the front, as well as the reaction-induced pressure wave behind the front, are shown to be in good agreement with experimental observations.

2933 **(SAND—82-1491C) Selected observations pertaining to various targets used in photo-optical instrumentation at Sandia National Laboratories.** Lenz, I.W. (Sandia National Labs., Albuquerque, NM (USA)). Aug 1982. Contract AC04-76DP00789. 27p. (CONF-820822—14). NTIS, PC A03/MF A01. Order Number DE83001274.

From 26. technical symposium and exhibition of the International Society for Optical Engineering; San Diego, CA, USA (21 Aug 1982).

The effects of paint colors and patterns applied to the bodies of missiles on the photographic images obtained during the flight testing of missiles are discussed with illustrations, and the types of targets, cameras, and target illumination used for obtaining this photographic data are described. (LCL)

4502 Nuclear

REFER ALSO TO CITATION(S) 2859, 2927, 3013

2934 **(AD—473906/6) Operation Crossroads. Radiological decontamination of target and non-target vessels. Volume I. Director of ship material technical inspection report.** Fee, J.J. (Joint Task Force One, Washington, DC (USA)). 1946. 145p. NTIS, PC A07/MF A01.

It was soon after Test Baker that the radioactive fission products were absorbed readily by rusty, porous and scaly surfaces loose paint, marine growths and algae. This fact was demonstrated forcibly on the lightly contaminated target APA's, which showed considerable radiation intensities on the outer shell in the vicinity of the waterline. The radioactive materials were lodged almost entirely in the marine growth and rust adhering to the shell. These vessels using ordinary paddle type bottom scrapers removed as much as practicable of the growth in the waterline area and thereby reduced considerably the amount of activity in that vicinity. They next proceeded outside the lagoon and steamed at high speed for a period of about 24 hours. The erosion of the water incident to this steaming resulted in a further reduction by about fifty percent. Continued streaming did not result in additional reduction of activity, however. Upon return to port, GENEVA wire-dragged the entire bottom using hogging lines and walking them down the length of the ship. This operation resulted in reducing the radiation levels inside the ship in the vicinity of the shell to tolerance limits for continuous occupancy.

2935 **(AD—473907/4) Operation Crossroads. Radiological decontamination of target and non-target vessels. Volume 2. Director of ship material technical inspection report.** Fee, J.J. (Joint Task Force One, Washington, DC (USA)). 1946. 145p. NTIS, PC A07/MF A01.

No abstract available.

2936 **(AD—473908/2) Operation Crossroads. Radiological decontamination of target and non-target vessels. volume 3. Director of ship material technical inspection report.** Fee, J.J. (Joint Task Force One, Washington, DC (USA)). 1946. 126p. NTIS, PC A07/MF A01.

Contents: Decontamination and Ship Clearance Directives; Miscellaneous Conference Notes; Directives for Future Decontamination Research.

2937 **(AD—483460/2) The effect of thermal radiation on materials.** Monahan, T.I. (New York Naval Shipyard, Brooklyn (USA). Material Lab.). 1952. 106p. NTIS, PC A06/MF A01.

Various material indicators were exposed to the thermal radiation of the atomic explosions at BUSTER to determine the effects of this exposure on these materials, the degree of correlation between these effects and those produced by laboratory sources of thermal radiation, and some of the characteristics of the radiation. These studies are a continuation of those made during GREENHOUSE, with emphasis on the effective time with regard to initiating and sustaining the process of damage to materials, the effects of target geometry, the evaluation of protective measures and and the irradiance-time and spectral characteristics of the radiation.

2938 **(AD-A—111830/6) Results of the SDCS (Special Data Collection System) attenuation experiment. Technical report.** Der, Z.A.; McElfresh, T.W.; O'Donnell, A. (Teledyne Geotech, Alexandria, VA (USA). Seismic Data Lab.). 30 Oct 1981. 277p. (SDAC-TR—80-4). NTIS, PC A13/MF A01.

Investigation of teleseismic arrivals at test sites in the western United States (WUS), a site on the Canadian shield and two sites in the northeastern United States revealed marked differences in mantle attenuation among these sites. All sites in the WUS show high attenuation in the underlying mantle, the sites in the northeastern U.S. appear to be intermediate between the WUS and the shield sites. This pattern fits well into the results of broader regional studies of amplitude anomalies, and spectral variations in both P and S waves. The high frequency content of teleseismic arrivals cannot be reconciled with the results of long period attenuation studies unless a frequency dependence of Q is assumed in the Earth. Preliminary curves for t vs. frequency are presented for shield and shield-to-tectonic type paths. These results demonstrate that yield estimates of explosions in different tectonic environments have to be corrected for mantle attenuation.

2939 **(AD-A—111855/3) I. the detectability of high frequency energy at teleseismic and regional distances. II. Studies of radiation from high-explosive and nuclear cratering events. Technical report.** Der, Z.A.; Blandford, R.R. (Teledyne Geotech, Alexandria, VA (USA). Seismic Data Lab.). 4 Mar 1981. 50p. (SDAC-TR—81-6). NTIS, PC A03/MF A01.

A survey of the literature on short-period seismic studies shows that seismic waves of high frequency in the 3-10 Hz range, can be observed regularly at both regional and teleseismic distances. These observations show that the low Q values proposed for the long-period seismic waves cannot be valid in the short-period band. The data indicate that, in the mantle, Q increases with frequency and may be as much as five times higher at 5-10 Hz than in the long-period band. Even with the most conservative assumptions, the level of high frequency amplitudes in the teleseismic P waves exceeds that predicted with a constant $t^*p = 1$ sec by a factor of at least 100,000 at and beyond 5 Hz. The apparent Q beta of the lithosphere, which may be largely due to scattering by the small scale inhomogeneities in the crust, also shows an increase with frequency by as much as a factor of four within the 1-10 Hz band. This parameter controls the attenuation and the detectability of seismic waves at regional distances such as Pn, Pg, Sn and Lg. These results indicate that deriving source diagnostics for explosions and earthquakes at both teleseismic and regional distances is possible utilizing high frequencies, and methods to do this must be developed further. A survey of existing data from cratering explosions reveals that there is no hard-rock transverse component digital data. The best all-around data available is that taken in Yucca Lake by Lawrence Livermore Laboratory in 1973-1974.

2940 **(AD-A—112106/0) Regional discrimination research. Final report, 1 May 1980-31 March 1981.** Bennett, T.J.; Lambert, D.G.; Murphy, J.R.; Savino, J.M.; Archambeau, C.B. (Systems, Science and Software, La Jolla, CA (USA)). Jun 1981. 87p. (SSS-R—81-5032). NTIS, PC A05/MF A01.

The objective of this project is to systematically assess the potential of regional phases for discriminating earthquakes and nuclear explosions with particular emphasis on defining the applicability of such discriminants to events in various regions of the U.S.S.R. The first research approach employs more traditional, time domain amplitude and period measurements to compare the relative excitation of different regional phases from earthquakes and explosions. The second approach focuses on the evaluation of the capabilities of other measurement or processing techniques, such as spectral ratios or narrow-band filtering, to identify seismic sources using regional phases. The principal technical phases of the regional discrimination research effort are: (1) review and assess time and frequency domain characteristics of regional seismic phases and evaluate their dependency on source type, propagation path and station environment; (2) Develop a tentative set of source identification criteria based on information from regional phases; and (3) Test proposed regional discriminants on observed data to determine their capability to identify earthquakes and explosions in various tectonic and geologic settings.

2941 **(AD-A—112911/3) Asymmetric collapse of LOS pipe. Final report 16 Jul-1 Sep 79.** Moore, E.T. Jr; Funston, R. (Physics International Co., San Leandro, CA (USA)). 26 May 1980. 76p. NTIS, PC A05/MF A01.

A single laboratory experiment was performed to further evaluate the feasibility of using asymmetries to suppress jetting in line-of-sight (LOS) pipes that are collapsed by the ground shock from an underground nuclear test. Underground conditions were simulated by using a sphere of high explosives to collapse eighteen small-scale models embedded in saturated sand. Two basic types of models were used in the experiment, symmetrical and asymmetrical.

The symmetrical models represented pipe configurations used by the Defense Nuclear Agency (DNA) in their underground nuclear test program. They were designated as standard models. The results showed that all of these models produced high-energy jets. All other models contained some form of asymmetry on the inside surface of the model. The asymmetries were selected to either cause an off-axis collapse which would inhibit the formation of a jet, or to attenuate and suppress a jet after it is formed. The results of the experiment show that high-energy jetting was present in all of the standard models, and was eliminated in the models with helical asymmetries. These findings continue to support the feasibility of using asymmetries to suppress jetting from the collapse of a pipe. However, their efficacy in a full-scale LOS pipe in an underground nuclear test environment cannot yet be postulated.

2942 **(AD-A—113112/7) Late dust pedestal rise mechanisms. Technical report.** Sowle, D.H.; Christian, R.H. (Mission Research Corp., Santa Barbara, CA (USA)). 31 Aug 1981. 34p. NTIS, PC A03/MF A01.

The mechanism of buoyant rise is found to be quantitatively consistent with readily available photographic data on the late dust pedestal of events Wasp Prime and Climax. The term 'late' refers to times after the rapid initial pedestal rise, and can be conveniently defined in terms of Liner's model. One implication of buoyancy as a driving force for late pedestal rise is that the average bulk density in most or all of the dust pedestal is small compared to air density, that is, small compared to 10-3 g/cm^3. A number of mechanisms other than buoyancy were investgated as causes for the late rise with discouraging results; these mechanisms are listed along with a brief description of the reasons each is untenable.

2943 **(AD-A—113537/5) Operation TEAPOT, 1955 continental nuclear weapons test series. Technical report.** Ponton, J.; Maag, C.; Wilkinson, M.; Shepanek, R.F. (JRB Associates, Inc., McLean, VA (USA)). 23 Nov 1981. 275p. NTIS, PC A12/MF A01.

This report describes the activities of an estimated 11,000 DOD personnel, both military and civilian, in Operation TEAPOT, the fifth atmospheric nuclear weapons testing series conducted in Nevada from 18 February to 15 May 1955. Activities engaging DOD personnel included Exercise Desert Rock VI observer programs, troop tests, and technical service programs; AEC scientific and diagnostic experiments to evaluate the effects of the nuclear device; DOD operational programs; and air support.

2944 **(AD-A—113538/3) Shot Apple 2, a test of the TEAPOT series, 5 May 1955. Technical report.** Ponton, J.; Wilkinson, M.; Rohrer, S. (JRB Associates, Inc., McLean, VA (USA)). 25 Nov 1981. 105p. NTIS, PC A06/MF A01.

This report describes the activities of more than 2,000 DOD personnel, both military and civilian, in Shot APPLE 2, the thirteenth nuclear test in the TEAPOT atmospheric nuclear weapons testing series. The test was conducted on 5 May 1955 and involved participants from Exercise Desert Rock VI, AFSWP, AFSWC, AEC, Test Groups, and the Air Weather Service. The largest activity was the test of an armored task force, Task Force RAZOR, which involved approximately 1,000 troops.

2945 **(AD-A—113539/1) Shot Bee, a test of the TEAPOT series, 22 March 1955. Technical report.** Maag, C.; Wilkinson, M.; Rohrer, S. (JRB Associates, Inc., McLean, VA (USA)). 24 Nov 1981. 87p. NTIS, PC A05/MF A01.

This report describes the activities of more than 3,000 DOD personnel, both military and civilian, in Shot BEE, the sixth nuclear test in the TEAPOT atmospheric nuclear weapons testing series. The test was conducted on 22 March 1955 and involved participants from Exercise Desert Rock VI, AFSWP, AFSWC, and the AEC Test Groups. The Marine Brigade Exercise troop test involved 2,271 Marines and was the largest single project conducted during Operation TEAPOT.

2946 **(AD-A—113685/2) Fission beta particles emitted into the geomagnetosphere. Memorandum report.** Bendel, W.L. (Naval Research Lab., Washington, DC (USA)). 15 Apr 1982. 20p. NTIS, PC A02/MF A01.

The spectrum of electrons emitted into the earth's magnetic field by an exoatmospheric nuclear burst is considerably more energetic than the spectrum of all delayed electrons from fission, a spectrum often used. A better electron spectrum for general use is presented. Some items are calculated, including a depth-dose curve, for the two spectra compared.

2947 **(NVO—249) Analysis of Operation PLUMBBOB nuclear test SMOKY radiological and meteorological data.** Quinn, V.E.; Kennedy, N.C.; Urban, V.D. (National Oceanic and Atmospheric Administration, Las Vegas, NV (USA). Weather Service Nuclear Support Office). Sep 1982. Contract AI08-76DP00351. 90p. NTIS, PC A05/MF A01. Order Number DE83001494.

Portions of document are illegible.

This report describes the Weather Service Nuclear Support Office (WSNSO) analyses of the radiological and meteorological data collected for the Operation PLUMBBOB SMOKY nuclear test. Inconsistencies in the radiological data and their resolution are discussed. The methods of estimating fallout arrival times are discussed. The meteorological situation on D-day and a few days following are described. A comparison of the fallout pattern resulting from these analyses and earlier (1958) analyses is presented. The radiological data used to derive the fallout patterns in the report are tabulated in an Appendix.

2948 **(UCID—19550) Use of nuclear explosions to create gas condensate storage in the USSR. LLL Treaty Verification Program.** Borg, I.Y. (Lawrence Livermore National Lab., CA (USA)). 23 Aug 1982. Contract W-7405-ENG-48. 16p. NTIS, PC A02/MF A01. Order Number DE82022515.

The Soviet Union has described industrial use of nuclear explosions to produce underground hydrocarbon storage. To examples are in the giant Orenburg gas condensate field. There is good reason to believe that three additional cavities were created in bedded salt in the yet to be fully developed giant Astrakhan gas condensate field in the region of the lower Volga. Although contrary to usual western practice, the cavities are believed to be used to store H_2S-rich, unstable gas condensate prior to processing in the main gas plants located tens of kilometers from the producing fields. Detonations at Orenburg and Astrakhan preceded plant construction. The use of nuclear explosions at several sites to create underground storage of highly corrosive liquid hydrocarbons suggests that the Soviets consider this time and cost effective. The possible benefits from such a plan include degasification and stabilization of the condensate before final processing, providing storage of condensate during periods of abnormally high natural gas production or during periods when condensate but not gas processing facilities are undergoing maintenance. Judging from information provided by Soviet specialists, the individual cavities have a maximum capacity on the order of 50,000 m^3.

50 ENVIRONMENTAL SCIENCES, ATMOSPHERIC

5001 Basic Studies

REFER ALSO TO CITATION(S) 2983

2949 **(BNL—31840) Documentation and data management for precipitation chemistry networks.** Benkovitz, C.M.; Dana, M.T. (Brookhaven National Lab., Upton, NY (USA); Pacific Northwest Lab., Richland, WA (USA)). 1982. Contract AC02-76CH00016;AC06-76RL01830. 17p. (CONF-820888—1). NTIS, PC A02/MF A01. Order Number DE83000210.

From Methods for comparing precipitation chemistry data workshop; Rensselaerville, NY, USA (10 Aug 1982).

Portions of document are illegible.

Traceability, which is really what this paper is all about (and the working groups involved with quality assurance are largely concerned with) should be defined, and the means by which information can be traced back through the sampling-to-data-base procedure should be specified in report format. Although the outside data user is not apt to do the tracing, the procedure through which

this is done and the time required for tracing information about a sample should be known.

2950 **(CONF-821054—1) Systematic analysis of climatic-model sensitivity to parameters and processes.** Hall, M.C.G.; Cacuci, D.G. (Oak Ridge National Lab., TN (USA)). 1982. Contract W-7405-ENG-26. 22p. NTIS, PC A02/MF A01. Order Number DE83001897.

From 4. symposium on climate processes: sensitivity to solar irradiance and CO/sub 2/; Palisades, NY, USA (25 Oct 1982).

A demonstration is presented of the adjoint method of sensitivity analysis on a radiative-convective climate model with a diurnal cycle. A single adjoint calculation, which requires about the same computation time as the original model, suffices to calculate sensitivities of average surface air temperature to all 312 model parameters. The sensitivities accurately predict the effect on average surface air temperature of small variations in the model parameters. Relative sensitivities rank the importance of all the parameters, the most important parameters being those that characterize solar radiation and determine transmission functions. The uncertainties in the model results are expressed formally in terms of all the sensitivities and parameter covariances. For this model, a 10% standard deviation in surface albedo causes the increase in average surface air temperature after doubling CO_2 to have a standard deviation of 0.24°K about the expected value of 1.66°K. For results that cannot readily be compared with observation (for example, the results of a CO_2 doubling experiment), this method of uncertainty analysis is the only systematic way to estimate the reliability of model results. This estimate of the reliability, though, will only be realistic if all important physical processes and feedback mechanisms have been included, however, crudely, in the model. The radiative-convective model contains complex on-off nonlinear processes of the type found in general circulation models. Therefore, the fact that the adjoint method works successfully and efficiently for the radiative-convective model provides valuable information about subsequent application of the method to general circulation models.

2951 **(DOE/EV/10665—2) Variation of arctic cloud cover in summer. Progress report, April 15, 1981-October 1, 1982.** Kukla, G.J. (Columbia Univ., Palisades, NY (USA). Lamont-Doherty Geological Observatory). Oct 1982. Contract AC02-81EV10665. 15p. NTIS, PC A02/MF A01. Order Number DE83002174.

The largest impact of increasing CO_2 should occur in the high latitudes according to climate models. However, an appropriate data base on cloud distribution and optical thickness is needed in order to improve and test the models as well as to enable the future detection of the CO_2 climate impact in high latitudes. Cloud cover over the Arctic Basin in late spring and summer of 1979 was charted in three day intervals based on NOAA and DMSP imagery. Three cloud types were recognized based on visually determined optical thickness. They are thick opaque stratus, thin transparent stratus, through which surface features are identifiable, and thin cirrus or fog. While 50 to 60% of the Arctic Basin was found to have stratus cloud, only about half this amount was of the optically thick type. This differs considerably from earlier estimates. Moreover, the day to day variability of cloud cover was found to be large. A comparison of cloud distribution with reconstructed pressure patterns show that the cloud distribution can be used to improve the charts. Ratios determined for cloud and cloud free conditions over both snow and open water were found to be useful in making numerical estimates of the optical thickness of clouds. Calibration of cloud type with the mean optical thickness is underway. Also tested was the detection of the cloud height from the width of the shadow. If the 1979 conditions were typical of recent years, substantial revisions will be needed in climate models assessing the CO_2 impact on climate.

2952 **(EDF-R—81H404351) On-board system for physical and microphysical measurements.** Ravaut, M.; Allet, C.; Dole, B.; Gribkoff, A.; Schibler, P.; Charpentier, C. (Electricite de France, 78 - Chatou. Direction des Etudes et Recherches). Oct 1981. 58p. (In French). NTIS (US Sales Only), PC A04/MF A01. Order Number DE82702543.

This report presents the system of physical and microphysical measurement instrumentation on board the HUREL-DUBOIS HD 34 aircraft, built in cooperation with the Institut National d'Astronomie et de Geophysique (I.N.A.G.) and the Institut Geographique National (I.G.N.). The feasibility study of the system was carried out in the first half of 1978 and took shape in an on-site proving campaign in November 1979. As a result, the on-board system was able to participate in the BUGEY experimental campaign of March 1980, a glimpse of which is given in this report.

2953 **(INIS-SU—111, pp 24) Radioactive kryptonates in environment pollution control.** Tolgyessy, J. (Slovenska Vysoka Skola Technicka, Bratislava (Czechoslovakia). Chemickotechnologicka Fakulta). 1981. NTIS (US Sales Only), PC A07/MF A01.

From 12. Mendeleev's conference on general and applied chemistry; Baku, USSR (21 Sep 1981).

2954 **(KFK—3090) Experimental determination of the atmospheric dispersion parameters at the Karlsruhe Nuclear Research Center for 60 m and 100 m emission heights. Pt. 1. Measured data.** Thomas, P.; Dilger, H.; Huebschmann, W.; Schuettelkopf, H.; Vogt, S. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.)). Sep 1981. 152p. Dep. NTIS (US Sales Only), MF A01. Order Number DE82750210.

Experiments have been carried out at the Karlsruhe Nuclear Research Center in order to investigate the atmospheric diffusion of pollutants. The influence on atmospheric diffusion of topographic conditions specific to the site is to be determined. For this purpose, halogenated hydrocarbons are emitted at 60 m and 100 m height; their local concentration distribution is measured at ground level downwind of the source. Part 1 of the report describes the diffusion experiments performed and presents the measured data in a detailed manner. The data include the coordinates of the sampling positions, the measured concentrations and the relevant meteorological data recorded during the experiments. The stability classes prevailing during the experiments are derived from these data and are indicated.

2955 **(UCID—19555) Progress report on the work for others agreement with the Bay Area Air Quality Management District Modification No. 3.** Penner, J.E. (Lawrence Livermore National Lab., CA (USA)). 13 Sep 1982. Contract W-7405-ENG-48. 7p. NTIS, PC A02/MF A01. Order Number DE83000019.

An analysis was conducted in the San Francisco Bay Area to determine how specifications of the mixed-layer depth and wind fields affect calculated pollutant levels. The meteorological parameters were varied in ways that were consistent with the data. Five tests were made. Results for layer-average ozone are tabulated.

2956 **(UCRL—88109) Have we detected CO_2-induced climate change: problems and prospects.** MacCracken, M.C. (Lawrence Livermore National Lab., CA (USA)). 7 Oct 1982. Contract W-7405-ENG-48. 44p. (CONF-820970—1). NTIS, PC A03/MF A01. Order Number DE83002161.

From CO/sub 2/ research conference; Berkeley Springs, WV, USA (19 Sep 1982).

Several recent studies have contended that the increase in CO_2 concentrations since the start of the Industrial Revolution has led to identifiable climatic warming. Significant approximations and simplifications have had to be made, however, in order to isolate this supposed CO_2 effect from the comparably large latitudinal and temporal temperature variations that may have been due to changes in volcanism, solar variability, other potentially identifiable causal factors, or natural fluctuations. To overcome the resulting uncertainties, data bases must be improved, diagnostic analyses and numerical models must more completely treat the spatial and temporal patterns and phase relations of the expected changes, and a careful search for a set of CO_2-specific climate modifications must be undertaken.

2957 **Impact of the Wangara Experiment.** Hess, G.D.; Hicks, B.B.; Yamada, T. (Argonne National Lab., IL). *Boundary-Layer Meteorology;* **20**: 135-174(1981).

The greatest impact of the Wangara Experiment has been to provide a data bank which could be used to test numerical simulations of the ABL. This has been useful not only for the newly developed higher-order closure models, but also for one-layer integral models predicting the height of the mixed layer and the height of the nocturnal surface inversion layer. Lastly, the Wangara Experiment has pointed out some of the limitations and difficulties of obtaining accurate measurements of thermal winds, vertical velocity, acceleration terms, and representative spatially averaged fluxes. Microscale turbulence measurements outside the surface layer were not included in the Wangara Experiment and further experiments are needed to determine these statistics.

5002 Chemicals Monitoring And Transport

REFER ALSO TO CITATION(S) 1580, 1582, 2075, 2665, 2675, 2767, 2954, 2955, 3090, 3091, 3095, 3096, 3097, 3098, 3101

2958 **(ANL/EES-TM—193) Evaluation of the feasibility of a regional intermittent control strategy for sulfur dioxide.** Knudson, D.A. (Argonne National Lab., IL (USA); Teknekron Research, Inc., Waltham, MA (USA)). Jun 1981. Contract W-31-109-ENG-38. 62p. NTIS, PC A04/MF A01. Order Number DE83000940.

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Sulfate deposition patterns in eastern North America were investigated in order to define the contribution of short-term high concentrations to the annual sulfate loading. In the investigation of sulfate deposition patterns, sulfate episodicity is defined as the tendency for substantial additions to the total annual sulfate load to be contributed during short-term events. Sulfate concentration patterns are examined for many eastern US Air Quality Control Regions (AQCRs). Analysis of those AQCR averages indicates that sulfate episodicity is a regional phenomenon, lacking a clear subregional variation. These data also show that approximately 30% of the annual sulfate burden is contributed during eight episode events totaling 46 to 50 days annually. Similarly, sulfate episodicity at the 10% level is associated with only two episodes, totaling about 10 days per year. AQCR average sulfate data signaled two episodes during the summer of 1976 as candidates for the modeling exercise. From these, the stagnation episode in mid through late August was selected for analysis. The model used to predict ambient sulfate levels is the Regional Episodic Grid Model (REGMOD). Comparison of predicted sulfate concentrations for full and reduced emissions shows moderate reduction in short-term concentrations for receptor areas at distances of several hundred kilometers from the source area, where the emissions reductions were implemented. Several potential regional intermittent control strategies (ICS)/supplemental control strategies (SCS) are qualitatively discussed. The overall conclusion from this preliminary study is that, although atmospheric sulfate deposition is somewhat episodic, implementation of a regional ICS/SCS which uses this episodicity to mitigate impacts at selected receptor areas would probably yield only marginal results.

2959 **(INIS-mf—7162) Modelling and tracer studies of atmospheric dispersion and deposition in regions of complex topography.** Norden, C.E. (Natal Univ., Durban (South Africa)). Nov 1981. 317p. NTIS (US Sales Only), PC A14/MF A01. Order Number DE83780004.

Thesis.

An indium tracer aerosol generating apparatus based on an alcohol/oxygen burner, and an analytical procedure by which filter samples containing tracer material could be analysed quantitatively by means of neutron activation analysis, were developed for use in atmospheric dispersion and deposition studies. A number of series of atmospheric dispersion experiments were conducted in the Richards Bay and Koeberg- Cape Town areas. The results are given, comparing the airbone tracer concentrations measured at ground level with values predicted by means of a numerical model, utilising two to three schemes, varying in sophistication, for calculating the dispersion coefficients. Recommendations are given regarding a dispersion model and dispersion coefficients for regular use in the Koeberg area, and ways for estimating plume trajectories.

2960 **(Juel—1981) Anthropogenic contribution to the atmospheric sulfur and nitrogen cycle and possible global effects on chemical reactions in the atmosphere.** Janssen-Schmidt, Th.; Roeth, E.P.; Varhelyi, G.; Gravenhorst, G. (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.)). Jul 1981. 84p. (In German). NTIS (US Sales Only), PC A05/MF A01. Order Number DE82902923.

Portions of document are illegible.

Studies are made of atmospheric sulfur dioxide and nitrogen oxide conversion which indicate that the most important biogenic sources for natural sulfur production are $(CH_3)_2S$ emission from the ocean and the evaporation products from reduced sulfur compounds from tropical soil which account for at most a third of the total anthropogenic sulfur sources. Estimates are made of the anthropogenic NO/sub x/ and SO_2 concentration up to the year 2020, and that relationship to tropospheric ozone content is discussed. 200 references, 25 tables, 11 figures.

2961 **(LA—9145-MS) Correlation analysis of workplace air-sampling data collected at coal gasifiers.** Scripsick, R.C.; Sherman, R.J.; Brink, E.J. (Los Alamos National Lab., NM (USA)). Sep 1982. Contract W-7405-ENG-36. 34p. NTIS, PC A03/MF A01. Order Number DE83002311.

Portions of document are illegible.

Several simultaneous sets of air samples for hydrogen sulfide, carbon monoxide, cyclohexane extractable particles, and cyclohexane extractable vapors were collected at two coal gasifiers. The cyclohexane extracts were analyzed to determine the air concentrations of six polycyclic aromatic hydrocarbon (PAH) fractions in addition to determining total extractable levels. Estimates of air concentrations were examined to determine the correlation between set elements. Results of this analysis were used to evaluate set elements as possible indicator substances for monitoring worker exposure to process fugitive emissions. In general, set elements of the same physical state, either particulate or vapor, correlated better with each other than with elements of unlike states. The potential indicator relationships found in the study relate individual PAH fractions to other individual PAH fractions of the same physical state and to the total PAH fractions of the same physical state. No correlation was found between levels of materials measured and either CO or cyclohexane extractable levels. H_2S levels were below minimum measurable levels of 0.5 ppM so that no correlation determination could be made between H_2S and other materials measured. These results suggest that CO is probably not a suitable indicator substance for the conditions studied. The use of individual PAH fractions as indicators of other individual PAH fraction levels and of total PAH fraction levels was found to be technically feasible, but of limited value.

2962 **(PB—82-180324) Alternative electric generation impact simulator. Final summary report.** Gruhl, J.; Coate, D.; Schweppe, E. (Massachusetts Inst. of Tech., Cambridge (USA). Energy Lab.). Aug 1981. 124p. (MIT-EL—81-044). NTIS, PC A06/MF A01.

This report is a short summary of three related research tasks that were conducted during the project 'Alternative Electric Generation Impact Simulator.' The first of these tasks combines several different types of investigations aimed at exploring the potential for, and significance of, uncertainty in the energy technology assessment process. A survey and discussion is presented of technology assessments, primarily from a methodological viewpoint. A general ideal methodology is developed and the potentials for incorporating uncertainties are described. There is particular emphasis on the impacts of assumptions and potential methods for incorporating concepts of uncertainty. The implementation of an ideal assessment methodology resulted in the second task involving the coding of a simulator that should be viewed as a framework for assembling and manipulating information about the economics, emissions, ambient concentrations, and potential health impacts of different types and configurations of electric power generating facilities. The framework is probabilistic, and thus results in several measures of the range of various consequences, in other words a graphic display of the quality of the various predictions. The simulator is structured so that it is easy to improve the sophistication of certain manipulations, or to replace generic data, or update or add

new data. The latest version of the simulator is available from the authors and can be operated in batch or interactive modes.

2963 **(PB—82-187337) Receptor model technical series: Volume 1. Overview of receptor model application to particulate source apportionment. Final report.** Core, J.E. (Environmental Protection Agency, Research Triangle Park, NC (USA). Office of Air Quality Planning and Standards). Jul 1981. 81p. NTIS, PC A05/MF A01.

Volume I of the Receptor Model Technical Series presents an overview of current particulate source apportionment methods and their applications to control strategy development programs. It is the first in a series of documents describing methods which can be used to identify source impacts, using data collected at the receptor. This is unlike source (dispersion) models that estimate source strengths based on emission factors, plume behavior and meteorology. Volume II of the series describes the Chemical Mass Balance Receptor Model in detail. Future volumes will describe other receptor model techniques. Information presented in this series is directed to regulatory professionals responsible for particulate control strategy development or related programs requiring source apportionment analysis. Major receptor methods are discussed, applications to control strategy development are presented and areas in which receptor models compliment source (dispersion) models are explored. Properly applied, and with supportive evidence developed through independent approaches, receptor models can be used independently or in concert with dispersion models, to provide important new information to regulatory agencies.

2964 **(PB—82-187345) Receptor model technical series: Volume 2. Chemical mass balance. Final report.** Core, J.E. (Environmental Protection Agency, Research Triangle Park, NC (USA). Office of Air Quality Planning and Standards). Jul 1981. 132p. NTIS, PC A07/MF A01.

Recent improvements in air sampling and analytical techniques have stimulated rapid growth in new techniques of source impact analysis using receptor models. These models 'decode' the chemical fingerprints and variability of the ambient aerosol to back-calculate source impacts. Unlike source (dispersion) models that estimate source strengths from emission rate, meteorology and stack parameters, receptor techniques separate source contribution to the total, fine, coarse, or inhalable particulate mass using data from ambient aerosol measurements. This document is the second of a series describing how receptor models can be used by State and local regulatory agencies to identify particulate source impacts. Volume I (PB82-187337) provides an overview of Receptor Model Applications, while Volume II focuses on the Chemical Mass Balance technique, model theory and input requirements. Case studies of applications in control strategies development are presented. Program design, ambient and source testing considerations, the use of receptor models in validating dispersion models and other potential application are discussed. This document is intended to provide those responsible for the development of particulate control strategies, airshed management and source impact assessment with new information on the Chemical Mass Balance method.

2965 **(PB—82-189549) Receptor models relating ambient suspended particulate matter to sources. Final report Nov 79-Sep 80.** Watson, J.G. (Environmental Research and Technology, Inc., Concord, MA (USA)). Mar 1981. 100p. NTIS, PC A05/MF A01.

The report describes the use of receptor models to determine the source contributions to ambient particulate matter loadings at sampling sites, based on common properties between sources and receptors. (This is in contrast to using source models which start with emission rates and meteorological measurements to predict ambient concentrations). Three generic receptor models have been identified: chemical mass balance, multivariate, and microscopial identification. Each has certain requirements for input data to provide a specific output. An approach that combined receptor and source models, source/receptor model hybridization, has also been proposed, but it needs further study. The input to receptor models is obtained from ambient sampling, source sampling, and sample analysis. The design of the experiment is important in obtaining the most information for the least cost. Sampling schedule, sample duration, and particle sizing are part of the ambient sampling design. Analysis for elements, ions, carbon, and organic and inorganic compounds is included in the sample analysis design. Which sources to sample and how to sample them are part of the source sampling design.

2966 **(PB—82-189887) The measurement and analysis of resuspended dust from roadways in Texas. Research report (final).** Bullin, J.A.; Moe, R.D.; Miculka, J.P. (Texas Transportation Inst., College Station (USA)). Oct 1979. 368p. NTIS, PC A16/MF A01.

Airborne particulate concentrations along Texas roadways were monitored at four sites in three cities. The instrumentation used for this study consisted of ten stacked filter units, eight flow controlled high volume air samplers, and four Lundgren impactors. Instruments were placed 150 ft. (45.7m) upwind and at assorted distances up to 300 ft. (91.4m) downwind of each roadway. The stacked filter units were spread from 5 to 90 ft. (1.5 to 27.4m) above ground level. All other instrumentation was set at a five foot elevation. Sampling times varied from 2 to 12 hours per sample. A total of approximately 40 hours of data were collected at each site in Dallas, San Antonio and El Paso. Traffic and meteorology data were taken by another project monitoring gaseous pollutants concurrently at the same sites. Total suspended particulates were determined by weighing all hivol filters before and after they were used. The TSP loadings on many of the stacked filter units were also determined. All filters were subjected to quantitative elemental analysis using one of two independent energy dispersive spectrometers. Many filters were examined using both systems. The results of the particulate collection project are presented herein.

2967 **(PB—82-190711) Southern california offshore air quality model validation study. Volume I: executive summary. Final report.** Zannetti, P.; Wilbur, D.M.; Baxter, R.A. (AeroVironment, Inc., Pasadena, CA (USA)). Nov 1981. 11p. NTIS, PC A02/MF A01.

This volume summarizes the significant results of a BLM-funded study conducted jointly by AeroVironment Inc. and the Naval Postgraduate School to validate and/or modify screening models commonly used to predict onshore air quality impacts from outer continental shelf (OCS) emission sources. The study involved both field experiments and computer modeling analysis to give a better understanding of dispersion over water and at the land/sea interface. Two field experiments were performed releasing SF6 tracer gas from a research vessel offshore the Ventura-Oxnard, California coastal area in September, 1980 and January, 1981. Modifications are discussed for standard Gaussian models to predict peak plume concentration values, the horizontal and vertical shape of the plume, and peak ground-level impacts from OCS emission sources.

2968 **(PB—82-190729) Southern california offshore air quality model validation study. Volume II: synthesis of findings. Final report.** Zannetti, P.; Wilbur, D.M.; Baxter, R.A. (AeroVironment, Inc., Pasadena, CA (USA)). Nov 1981. 218p. NTIS, PC A10/MF A01.

This volume describes the significant results of a BLM-funded study conducted jointly by AeroVironment Inc. and the Naval Postgraduate School to validate and/or modify screening models commonly used to predict onshore air quality impacts from outer continental shelf (OCS) emission sources. The study involved both field experiments and computer modeling analysis to give a better understanding of dispersion over water and at the land/sea interface. Two field experiments were performed releasing SF tracer gas from a research vessel offshore the Ventura-Oxnard, California coastal area in September, 1980 and January, 1981. Modifications are discussed for standard Gaussian models to predict peak plume concentration values, the horizontal and vertical shape of the plume, and peak ground-level impacts from OCS emission sources.

2969 **(PB—82-192097) Field tests of industrial stoker coal-fired boilers for emissions control and efficiency improvement: sites 11-17 (data supplement). Report for Feb 78-May 79.** Davis, J.W.; Owens, H.K. (Pennsylvania State Univ., University Park (USA)). Apr 1981. 81p. NTIS, PC A05/MF A01.

The supplement is a compilation of test data presented in greater detail than was practical in the related final technical report (PB81-196628. It provides details to researchers who are interested in performing their own analyses. The final technical report gives objectives; describes facilities tested, coals fired, and test equipment; outlines procedures; and provides interpretations and conclusions. The supplement contains panel board data for each test, detailed particulate data, and particle size distribution data.

2970 **(PB—82-192147) Studies of air quality on and near highways. Interim report No. 1, 1973-74.** Dabberdt, W.F.; Cagliostro, D.J.; Meisel, W.S.; Horowitz, A.J.; Skinner, G. (Stanford Research Inst., Menlo Park, CA (USA)). Jul 1974. 96p. NTIS, PC A05/MF A01.

The first year effort on the study 'Analyses, Experimental Studies, and Evaluations of Air Control Measures for Air Flow and Air Quality On and Near Highways' is presented. The objectives were amplified to indicate a better understanding of the role of vehicle traffic, meteorological parameters, adjacent building and roadway configurations. The development of simulations or models for concentrations of air pollutants near roadways and guidelines for management of air quality on and near highways were also presented. A descriptive model was developed. Essential guidance for wind tunnel simulation and road atmospheric experiments was obtained from the descriptive modeling.

2971 **(PB—82-193111) Control technology summary report on the primary nonferrous metals industry. Volume IV: appendix C. Review of the testimony presented at the 1977 OSHA public hearings on inorganic lead. Report for Mar-May 77.** Hoover, J.R. (Radian Corp., Austin, TX (USA)). Dec 1978. 125p. NTIS, PC A06/MF A01.

The 1977 public hearings on the development of control technologies for inorganic lead (7439921) exposure in primary nonferrous metals industries are reviewed. Engineering and administrative controls, personal protective equipment, work practices, and maintenance and housekeeping practices are discussed along with cost effectiveness considerations. Engineering control effectiveness and feasibility projections with applications in primary and secondary lead smelters are presented. Selected exhibits from previous hearings, inorganic lead exhibits in particular, are discussed. The author concludes that a lack of data on engineering controls exists which might hinder control implementation in lead smelters.

2972 **(PB—82-193129) Control technology summary report on the primary nonferrous metals industry. Volume V: appendix D. Review of the testimony presented at the 1977 OSHA public hearings on sulfur dioxide.** Hoover, J.R. (Radian Corp., Austin, TX (USA)). 15 Dec 1978. 178p. NTIS, PC A09/MF A01.

The 1977 public hearings on the development of control technology for exposure to sulfur-dioxide (7446095) in the primary nonferrous metals industry are reviewed. Engineering and administrative controls, personnel protective equipment, work practices, and preventive maintenance practices are discussed along with cost effectiveness considerations. Engineering control effectiveness and feasibility projections as applied to areas where sulfur-dioxide exposure exists are described. A large variety of ventilation and enclosure techniques for controlling and minimizing exposure are presented. Selected exhibits are discussed and past sulfur-dioxide hearing exhibits are reprinted. Considerations for economic feasibility also are discussed.

2973 **(PB—82-194036) The progress of regulations to protect stratospheric ozone: report to congress. Report for aug 79-dec 81.** (Environmental Protection Agency, Washington, DC (USA). Office of Toxic Substances). Feb 1982. 32p. NTIS, PC A03/MF A01.

As mandated by Section 155 of the Clean Air Act Amendments of 1977, EPA has submitted to Congress in February 1982, a report on the progress of regulation to protect stratospheric ozone covering the period from August 1979 to December 1981. The report reviews activities related to the protection of stratospheric ozone from potential depletion due to emissions of chlorofluorocarbons (CFCs) and other ozone-depleting substances. Although the 1978 EPA and FDA regulations prohibited the manufacturing and processing of CFCs for non-essential aerosol uses, anticipated market growth in some non-aerosol uses may eventually offset the reductions achieved by the aerosol rule. In addition to CFCs, other potential ozone depleting substances are being investigated by EPA and other agencies. At the international level Japan and the European Economic Community have limited CFC-11 and CFC-12 production capacity to present levels while several nations are assessing the feasibility of reducing emissions from other uses. EPA and other Federal agencies will continue to monitor and support research to improve our understanding of atmospheric, health and environmental science of ozone depletion, technological capabilities and costs for limiting CFC emissions. Any decision regarding EPA action would be based on an evaluation of all these factors.

2974 **(PB—82-195215) Building ventilation measurements, predictions, and standards. Final report.** McNall, P.E. Jr. (National Bureau of Standards, Washington, DC (USA)). Jun 1981. 15p. Pub. in Proceedings of Symposium on Indoor Air Pollution, Committee on Public Health, Held at New York Academy of Medicine, NY on May 28-29, 1981. Bull. New York Academy of Medicine 57, n10 p1027-1042 Dec 81.

This paper discusses the energy importance of reduced ventilation. The new ASHRAE Standard 62-1981, Ventilation for Acceptable Indoor Air Quality, and extensive field measurements of ventilation are discussed. A predictive model for indoor air contaminant concentrations in residences and its verification are presented and the effects of several variables are discussed. Additional research on the indoor emanation rates of contaminants which are or may be health hazards would enable the prediction of indoor contaminant levels with various control options. Such predictions could be used to verify or refine indoor air quality standards.

2975 **(PB—82-195702) Findings of CO hot spot analysis for Mecklenburg County, NC. Final report.** (Peat, Marwick, Mitchell and Co., Washington, DC (USA)). 11 Mar 1982. 102p. NTIS, PC A06/MF A01.

This report details the analysis of transportation control measures to be implemented in order to achieve the National Ambient Air Quality Standards at selected carbon monoxide hotspots in Mecklenburg County, North Carolina.

2976 **(PB—82-196148) Feasibility of developing source sampling methods for asbestos emissions. Final report 23 Dec 80-30 Jun 81.** Henry, W.M.; Sverdrup, G.M.; Schmidt, E.W.; Miller, S.E. (Battelle Columbus Labs., OH (USA)). Apr 1982. 70p. NTIS, PC A04/MF A01.

The objective of this program was to determine the feasibility of developing methods for sampling asbestos in the emissions of major asbestos sources: (1) ore production and taconite production, (2) asbestos-cement production, (3) asbestos felt and paper production, and (4) the production of asbestos-containing friction materials. Potential sampling methods must provide samples compatible with the provisional analysis methods using electron microscopy (U.S. EPA Report No. 600/2-77-178). Two general criteria for source sampling methods were identified as: (1) the sampling method must be capable of collecting a representative sample and (2) the asbestos emissions must be collected in such a manner that they can be analyzed by the provisional analytical method. Concurrent investigations of potential emissions in the industries and of current knowledge of sampling fibers were undertaken to assess the feasibility of meeting the first criterion. The industry survey revealed that asbestos emissions can be divided into two classes: stack and fugitive. With respect to the second criterion, it is not feasible to undertake a methods development program for strict compatibility with the recommended procedure of the provisional analytical method. However, methods development programs are feasible if the sampling method is to be compatible with the alternative procedures of the provisional method or general electron microscopy.

2977 **(PB—82-197187) Validation of the EKMA model using historical air quality data. Final report.** Trijonis, J.; Mortimer, S.; Dimitriades, B. (Technology Service Corp., Santa Monica, CA (USA)). Apr 1982. 145p. NTIS, PC A07/MF A01.

Historical air quality and emissions trend data for the Los Angeles region were used to check the EKMA isopleth method of relating ozone concentration changes to precursor emission changes. Trends in ozone and ozone precursors (NMHC and NOx) were estimated from data for the period 1964 to 1978. Emission trend calculations show that basinwide hydrocarbon emissions decreased continually, with a net reduction of 29% over the study period. Estimated basinwide NOx emissions rose rapidly from the middle 1960s to the early 1970s and then levelled off; the net increase over the study period was 34%. Sensitivity analysis reveal that predicted ozone trends are moderately sensitive to the specific EKMA simulation conditions. Predicted ozone trends are extremely sensitive to the NMHC/NOx ratio. The EKMA model performs fairly well in the validation studies. There is, however, a general tendency for predicted ozone trends to underestimate historical decreases in actual ozone trends. One reason for the discrepancy appears to be error in the choice of an NMHC/NOx ratio.

2978 **(PB—82-197195) In-situ aerodynamic sizing of aerosol particles with the SPART analyzer. Final report Jun 76-Feb 80.** Mazumder, M.K.; Ware, R.E.; Wilson, J.D.; Renninger, R.G.; McLeod, P.C. (Arkansas Univ., Little Rock (USA)). Apr 1982. 47p. NTIS, PC A03/MF A01.

A single particle aerodynamic relaxation time (SPART) analyzer has been developed to measure the aerodynamic size distribution of aerosol particulates in the range 0.1 to 10.0 micrometer in diameter. The analyzer sizes and counts individual suspended particles and droplets from sampled aerosols, determines their aerodynamic diameter, and generates the size distribution in real-time. The measurement is independent of the electrical and optical properties of the particles. The size range and resolution of the SPART analyzer depend on the acoustic frequency. Operating at 27 kHz, the instrument's effective sampling rate was calibrated in the range of 0.3 to 6.0 pm using test aerosols containing monodisperse polystyrene latex spheres (PLS) and olive oil droplets. The instrument can count and size aerosol particulates at a maximum rate of 200 particles/sec. The sensing volume of the instrument is approximately .00001 cc, which allows the size distribution measurement of an aerosol containing a relatively high particulate concentration without an appreciable coincidence loss.

2979 **(PB—82-197518) Ohio River Basin Energy Study: air quality and related impacts. Volume I. Documentation in support of key ORBES air quality findings.** Stukel, J.J.; Niemann, B.L. (Illinois Univ., Urbana (USA)). Nov 1980. 162p. NTIS, PC A08/MF A01.

This report was prepared as part of the Ohio River Basin Energy Study (ORBES), a multi-disciplinary research program supported by the Environmental Protection Agency. The extensive air quality analysis undertaken for the ORBES included examination of pollutant emissions and resulting concentrations under various policy assumptions; collection of additional particulate and sulfur oxide measurements from the utilities for use in the analysis of current conditions; evaluation of the meteorological conditions under which maximum pollutant concentrations are likely to occur; examination of the validity of using conventional dispersion models for predicting worst-case pollution conditions; and cataloguing meteorological conditions under which regional pollution episodes occur. In this report, the focus is on the factual materials used to formulate the key air quality findings set forth in the main report of this study. It draws from Volumes II and III of the same series. Volume II is entitled 'Air Quality and Meteorology in the Ohio River Basin: Baseline and Future Impacts;' Volume III, 'Selected Impacts of Electric Utility Operations in the Ohio River Basin (1976-2000):An Application of the Utility Simulation Model.'.

2980 **(PB—82-197872) Mitigating the impacts of energy facilities: a local air quality program for the Wilmington, North Carolina area.** (North Carolina Coastal Energy Impact Program, Raleigh (USA)). Jan 1981. 81p. NTIS, PC A05/MF A01.

A system of air quality analysis and review which will anticipate and mitigate coastal energy facility-related air quality impacts in the Wilmington (N.C.) area is presented. A planning approach to air quality management is recommended to the Cape Fear Council of Governments to evaluate alternative emissions scenarios, select the preferred path for economic development, and protect health and property from deleterious impacts of air pollution.

2981 **(PB—82-198417) Design, fabrication and testing of ambient aerosol sampler inlets. Final report May 79-Oct 80.** Wedding, J.B.; Weigand, M.A. (Research Inst. of Colorado, Fort Collins (USA)). Apr 1982. 31p. NTIS, PC A03/MF A01.

Data are presented on the wind tunnel performances of two prototype Inhalable Particulate Matter (IPM) inlets designed for use with a dichotomous sampler. One was developed at the Aerosol Science Laboratory (ASL) Colorado State University, while the other was developed in an independent effort at the University of Minnesota (UM) and Lawrence Berkeley Laboratory (LBL). The ASL inlet is based on a unique omnidirectional cyclone fractionator, described in detail. Over the range of wind speeds from 0.5 - 24 km/hr, its measured 50% cutpoint was virtually invariant, 14.4 - 13.7 micrometers--well within the presently proposed IPM 50% cutpoint requirement. The UMLBL inlet results indicated near compliance with the IPM performance envelope, but there remain some small differences in data generated by UM and ASL personnel. Enrichment is apparent for both inlets in the 1 - 10 micrometers particle size range at the highest wind speed.

2982 **(PB—82-198508) Outdoor smog chamber experiments to test photochemical models. Final report May 78-May 81.** Feffries, H.E.; Kamens, R.M.; Sexron, K.G.; Gerhardt, A.A. (North Carolina Univ., Chapel Hill (USA). School of Public Health). Apr 1982. 280p. NTIS, PC A13/MF A01.

The smog chamber facility of the University of North Carolina was used in a study to provide experimental data for developing and testing kinetic mechanisms of photochemical smog formation. The smog chamber, located outdoors in rural North Carolina, is an A-frame structure covered with Teflon film. Because the chamber is partitioned into two sections, each with a volume of 156 cu m, two experiments can be conducted simultaneously. The dual chamber is operated under natural conditions of solar radiation, temperature, and relative humidity. In this study, 115 dual all-day experiments were conducted using NOx and a variety of organic species. The organic compounds investigated included various paraffins, olefins, aromatics and oxygenates, both singly and in mixtures of two or more components. In this report the data collected over the three-year period of the study are described. The experimental procedures and analytical methods used in this study and the limitations and uncertainties of the data are discussed. Guidance for modeling of the data is also given, including a detailed discussion of how to estimate photolytic rate constants from the available UV and total solar radiation data and how to treat such chamber artifacts as dilution, wall sources and losses of pollutants, and reactivity of the background air.

2983 **(PB—82-200247) Meteorology and air quality modeling in complex terrain: a literature review.** DeMarrais, G.A.; Clark, T.L. (Environmental Protection Agency, Research Triangle Park, NC (USA). Environmental Sciences Research Lab.). Apr 1982. 116p. NTIS, PC A06/MF A01.

Modeling air quality in complex terrain has been and remains to be a difficult task simply because of the difficulty in parameterizing the complex wind flow regimes. Due to the complex terrain, significant submesoscale forces are established to perturb the mesoscale wind field. This literature review summarizes over 250 studies of meteorology and air quality modeling in complex terrain for the benefit of those who wish to broaden their knowledge of the subject.

2984 **(PB—82-209644) Causes and effects of stratospheric ozone reduction: an update. Final report.** (National Academy of Sciences - National Research Council, Washington, DC (USA)). Mar 1982. 348p. NTIS, PC A15/MF A01.

Estimates of steady-state reductions in stratospheric ozone due to continued releases of two chlorofluorocarbons (11 and 12) at 1977 rates in the absence of other perturbations are lower than 1979

estimates by a factor between two and three. Current models suggest the steady-state reduction will lie between 5 and 9 percent. The association of nonmelanoma skin cancers with ultraviolet-B radiation suggests that reductions in stratospheric ozone will result in increases of these cancers. Exposure to ultraviolet-B also has been shown to adversely affect the immune response system; further research is needed to determine the importance of this finding for understanding photocarcinogenesis.

2985 **(SAND—82-1773) Indoor air quality handbook: for designers, builders, and users of energy efficient residences.** (Sandia National Labs., Albuquerque, NM (USA); AnaChem, Inc., Albuquerque, NM (USA)). Sep 1982. Contract AC04-76DP00789. 174p. NTIS, PC A08/MF A01. Order Number DE83002315.

The purpose of this handbook is to assist designers, builders, and users of energy efficient residences to achieve the goals of energy efficiency and maintenance of high indoor air quality simultaneously. The handbook helps in identifying and controlling potential problems of indoor air quality. It identifies sources and discusses effective ways to decrease concentrations of air contaminants. It focuses on indoor air quality in both single and multifamily energy-efficient residences. Information about commercial structures such as hospitals and office buildings is presented when it also applies to residences. Basic concepts of contaminants and their concentrations, sources and removal mechanisms, contaminant distribution, heat transfer, and air exchange are discussed. The effects of the building system on indoor air quality are examined. The effects of the external environment, building envelope, environmental control systems, interior design, furnishings, and inhabitants on the emission, dispersion, and removal of indoor air contaminants as well as direct and indirect effects of energy-efficient features are discussed. The health effects of specific air contaminants and the health standards developed for them are examined. Available methods for predicting and measuring contaminants and for evaluating human responses are discussed. Methods and equipment available for the control of indoor air pollution once the contaminants have been identified are also evaluated. The potential legal aspects, including regulatory intervention and civil lawsuits, of failure to evaluate and control indoor air pollution are discussed. A list of references, a glossary, and an index are also included.

2986 **(UCRL—87535) Evaluation of permanently charged electrofibrous filters.** Biermann, A.H.; Lum, B.Y.; Bergman, W. (Lawrence Livermore National Lab., CA (USA)). 18 Oct 1982. Contract W-7405-ENG-48. 26p. (CONF-820833—14). NTIS, PC A03/MF A01. Order Number DE83001616.

From 17. DOE nuclear air cleaning conference; Denver, CO, USA (1 Aug 1982).

These studies showed that loading the permanently charged filters with captured aerosols will lead to a neutralization of the filter charge. The transfer from the captured aerosol to the fiber surface and the subsequent neutralization of fiber charge. The increased efficiency is due to the additional mechanical capture by the particle deposits. The minimum efficiency obtained during the loading of solid aerosols is determined by the aerosol charge, with highly charged aerosols producing a lower minimum. Permanently charged filters lose their fiber charge when exposed to organic solvents or ionic water solutions. The fiber charge neutralization was minimized by coating the charged fibers with a polymer. Several different coating techniques were examined. Unfortunately, preventing the neutralization of fiber charge is not sufficient to prevent a deterioration of filter efficiency.

2987 **Forum for discussion and debate.** pp 67-91 of Ozone trend detectability. Hampton, VA; National Aeronautics and Space Administration (1981).

The application of statistical methods to meteorological data for which there are long, compatible series, and where known trend changes took place was suggested. The effects of optical wedge deterioration, atmospheric aerosol variation, solar irradiance variations, etc., are evaluated. It is recommended that coupled satellite and ground based observational systems are required to determine long term global trends.

2988 **Sulfur and nitrogen compounds in urban aerosols.** Tanner, R.L. (Brookhaven National Laboratory, Upton, NY). *Annals of the New York Academy of Sciences;* 39-49(1980). (CONF-790115—).

From New York Academy of Sciences conference on aerosols: anthropogenic and natural-sources and transport; New York, NY, USA (9 Jan 1979).

Some results are reported for sulfate, nitrate, and related ionic species taken from a detailed chemical and meteorological data base that has been accumulated for the New York subregion since 1976 (the data base is generally referred to as the New York Summer and Winter Aerosol Studies). Some of the experimental advances in sampling and analysis of aerosol sulfur and nitrogen compounds and related gases are described that offer promise for the measurement of all components of the atmospheric sulfate-nitrate-SO_2-NO(x)-NH_3 system with a time resolution of a few minutes. These advances include aerosol sulfur measurement by real-time FPD, gaseous nitric acid sampling and analysis, and continuous ammonia analysis.

2989 **Aerosol formation in urban plumes over Lake Michigan.** Miller, D.F. (Battelle Columbus Laboratories, Columbus, OH); Alkezweeny, A.J. (Battelle Pacific Northwest Laboratories, Richland, WA). *Annals of the New York Academy of Sciences;* 219-232(1980). (CONF-790115—).

From New York Academy of Sciences conference on aerosols: anthropogenic and natural-sources and transport; New York, NY, USA (9 Jan 1979).

Results are reported for field measurements of sulfate aerosol formation in urban plumes from Milwaukee, Wis., that were transported over Lake Michigan by westerly winds. Various types of airborne measurements were made of, for example, light scattering, particles larger than 0.01 micron, the total concentration of condensation nuclei, total hydrocarbons, and concentrations of O_3, SO_2, NO, NO/sub x/, SO_4(-), trace metals, nitrate, and ammonium. Data on derived SO_2 oxidation rates are compared with the results of a chemical kinetics model that simulated the pollutant conditions. It is concluded that rates of SO_2 oxidation in isolated urban plumes appear to be quite variable, that kinetics modeling is hindered by an inadequate understanding of the free-radical chemistry that is strongly coupled to the NO/sub x/ cycles, and that the free-radical (HO_2, RO_2, O/sub H/) concentrations should be measured in real time so that instantaneous rates may be determined for SO_2 oxidation.

5003 Radioactive Materials Monitoring And Transport

REFER ALSO TO CITATION(S) 2859, 2947, 2985, 3002, 3003, 3005, 3009, 3027, 3050

2990 **(EGG—1183-1828) Aerial radiological survey of the US Department of Energy's Hanford site, Richland, Washington. Date of survey: May/June 1978.** Feimster, E.L.; Hilton, L.K. (EG and G, Inc., Las Vegas, NV (USA). Energy Measurements Group). Sep 1982. Contract AC08-76NV01183. 65p. NTIS, PC A04/MF A01. Order Number DE83001733.

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During the period from 1 May to 8 June 1978, a radiological survey was conducted over the Department of Energy's Hanford site. A previous survey of the site was performed in 1973. Both surveys were performed by the Energy Measurements Group of EG and G for DOE as part of a nationwide radiation monitoring program. The survey flights were flown at altitudes of 45 m or 60 m, depending on the area, by a helicopter containing 20 sodium iodide detectors. Analysis of the data indicated the predominant radioisotopes at the Hanford site were a mixture of ^{60}Co, ^{137}Cs, and naturally occurring radionuclides. The gross gamma activity, along with ^{137}Cs and/or ^{60}Co, is presented as isopleth photo overlays of equivalent exposure rate at 1 m above ground level.

2991 (INIS-mf—6937, pp vp) **Radioactive fallout measurements in Israel 1976-1978.** Dukhan, R.; Shamai, Y. (Israel Atomic Energy Commission, Yavne. Soreq Nuclear Research Center). 1980. NTIS (US Sales Only), PC A14/MF A01.

From Israel Nuclear Societies joint annual meeting; Beersheba, Israel (4 Dec 1980).

2992 **(Juel-Spez—126) Field experiments on the deposition velocity of aerosols on vegetation or other surfaces - documentation of results.** Jonas, R.; Vogt, K.J. (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Abt. Sicherheit und Strahlenschutz). Sep 1981. 60p. (In German). NTIS (US Sales Only), PC A04/MF A01. Order Number DE82750587.

From 1977 to 1980 forty-one experiments concerning the deposition velocity of aerosols on vegetation and other surfaces were carried out. In this report a documentation of the results of measurements with information about particle diameter, dry weight of the vegetation and meteorological parameters is given in chronological order.

5004 Thermal Effluents Monitoring And Transport

2993 **(PB—82-180241) Behaviour of buoyant moist plumes in turbulent atmospheres. Final report.** Hamza, R.; Golay, M.W. (Massachusetts Inst. of Tech., Cambridge (USA). Energy Lab.). Jun 1981. 405p. (MIT-EL—81-020). NTIS, PC A18/MF A01.

A widely applicable computational model of buoyant moist plumes in turbulent atmospheres has been constructed. To achieve this a one dimensional Planetary Boundary Layer (P.B.L.) model has been developed to account for atmospheric turbulence while the two dimensional time dependent fluid mechanics equations which govern plume behavior are numerically integrated. A cloud microphysics model has been incorporated into the basic numerical code to account properly for the water content of the plume. The overall dynamics of the plume is quite general. The buoyancy source in the plume includes both the sensible heat and the latent heat absorbed or released in the plume. The turbulence of the plume accounts for buoyancy generated or destroyed turbulence and a universal k-epsilon model has been set up along with the k-sigma model. The model is validated against complex field cases to demonstrate its ability to reproduce solutions to problems that are known. Comparisons to visible plume data show that both the dynamics of the plume are calculated with an acceptable accuracy. Comparisons with 'conventional' entrainment model show that the model can simulate plumes better since it takes into account more physical phenomena.

5006 Regulations

REFER ALSO TO CITATION(S) 2394, 2541, 2973

2994 **(DOE/EP—0065-Vol.3F) Environmental compliance guide. Guidance manual for Department of Energy compliance with the Clean Air Act: nonattainment areas.** (USDOE Assistant Secretary for Environmental Protection, Safety and Emergency Preparedness, Washington, DC. Office of Environmental Compliance). Sep 1982. 54p. NTIS, PC A04/MF A01. Order Number DE83001104.

The purpose of this manual is to identify information requirements associated with air quality permit applications in areas for which ambient pollutant levels currently exceed the national ambient air quality standards (nonattainment areas). The manual is to be used by project managers at the US Department of Energy (DOE), in conjunction with the DOE Environmental Compliance Guide, to provide preliminary estimates of information required to obtain air quality permits for DOE projects. An analysis of nonattainment area permitting found that permitting of all sources in such areas is done on the state or local levels; the Environmental Protection Agency does not grant permits in nonattainment areas. As a result, Federal information requirements for permitting in nonattainment areas are somewhat vague. To provide a more realistic picture of nonattainment area permitting, selected state and local regulations were surveyed, and were found to contain more detail on the information required for permit approval. The most potentially demanding information requirements associated with nonattainment area permitting are the determination of Lowest Achievable Emission Rate, the negotiation of external emission offsets, and the consideration of the environmental impacts of project alternatives in ozone and carbon monoxide nonattainment areas. In any state, a few information requirements for nonattainment area permitting are likely to overlap with information requirements of other permitting processes, such as those in the Prevention of Significant Deterioration procedure. These requirements are emissions data and air quality modeling and its associated input data requirements (meteorology, topography, etc.).

51 ENVIRONMENTAL SCIENCES, TERRESTRIAL

5101 Basic Studies

2995 **(LA—8787-NERP) Capture-recapture and removal methods for sampling closed populations.** White, G.C.; Anderson, D.R.; Burnham, K.P.; Otis, D.L. (Los Alamos National Lab., NM (USA)). Aug 1982. Contract W-7405-ENG-36. 249p. NTIS, PC A11/MF A01. Order Number DE83001934.

Portions of document are illegible.

The problem of estimating animal abundance is common in wildlife management and environmental impact assessment. Capture-recapture and removal methods are often used to estimate population size. Statistical Inference From Capture Data On Closed Animal Populations, a monograph by Otis et al. (1978), provides a comprehensive synthesis of much of the wildlife and statistical literature on the methods, as well as some extensions of the general theory. In our primer, we focus on capture-recapture and removal methods for trapping studies in which a population is assumed to be closed and do not treat open-population models, such as the Jolly-Seber model, or catch-effort methods in any detail. The primer, written for students interested in population estimation, is intended for use with the more theoretical monograph.

2996 **(PB—82-197088) Artic Terrestrial Environmental Research Programs of the Office of Energy Research, Department of Energy: evaluation and recommendations.** (National Academy of Sciences - National Research Council, Washington, DC (USA)). 1982. 80p. NTIS, PC A05/MF A01.

In this report, the Committee to Evaluate Department of Energy's Arctic Terrestrial Environmental Research Programs of the Polar Research Board considers possible energy-related developments in the Arctic, evaluates past efforts by DOE, US ERDA, and the US AEC to assess its environmental research related to these activities, and recommends a framework for future research activities of DOE in the North. Up to 50% of the recoverable oil remaining within U.S. jurisdiction may occur in the Arctic, and coal deposits are perhaps equal to those in the continental U.S. However, almost none of the infrastructures of economically developed areas exist, such as communities, roads, refineries, water and waste facilities, and transportation corridors.

2997 **(PB—82-197096) Arctic Terrestrial Environmental Research Programs of the Office of Energy Research, Department of Energy: evaluation and recommendations. Appendix A: terrestrial environmental research in Alaska during 1980-1981.** (National Academy of Sciences - National Research Council, Washington, DC (USA)). 1981. 224p. NTIS, PC A10/MF A01.

This report, an Appendix to the report Arctic Terrestrial Environmental Research Programs of the Office of Energy Research, Department of Energy: Evaluation and Recommendations, provides a review of ongoing and planned Arctic terrestrial environmental research in Alaska during 1980-1981. The report reviews which agency conducted Arctic-oriented ecological research; the goals, philosophies, and directions of these agencies; the financial support provided for Arctic terrestrial environmental research; and

whether the agencies have a relationship with the DOE's Ecological Research Program.

5102 Chemicals Monitoring And Transport

REFER ALSO TO CITATION(S) 1651, 1652, 3087

2998 **(AD-A—113067/3) Interactions of hydrazine and of hydrazine derivatives with soil constituents and with soils. Annual report 1 dec 80-1 dec 81.** Hayes, M.H.B.; Isaacson, P.J.; Chia, K.Y.; Lees, A.M. (Birmingham Univ. (UK). Dept. of Chemistry). 31 Jan 1982. 37p. NTIS, PC A03/MF A01.

Studies have demonstrated that at high pH, in the solution phase, colloids catalyse hydrazine degradation. This catalysis is particularly dependent upon the exchangeable metal cations held by the colloids, and exceeds that of equivalent solutions of the metal cations alone. Hydrazines can be strongly or weakly sorbed by soil colloids in essentially unchanged forms, or can be irreversibly chemisorbed. Reversible ion-exchange is the main mechanism of hydrazine/clay interaction at low pH. Insoluble iron-and aluminium-hydrous oxides form on the surfaces of suitably exchanged clays at high pH, and these bind large amounts of hydrazines by strong hydrogen-bonding forces and by hydrazination of cationic species. Such binding partially destabilises hydrazine towards thermal degradation. Hydrazines interact with humic colloids by chemisorption, by ion-exchange, and by hydrazination of strongly polarizing cations. The reactivity of humates is determined by their exchangeable metal cations, and by the pH, which both affect their penetrability and solubility. Clay colloids and goethite react strongly with hydrazines from the vapour phase. Results show that the hydrazines can compete well with water for interaction sites. Preliminary results from whole soil/hydrazine experiments show the large capacity of different soil types for interaction with hydrazines. A copper(II)-treated, aerated clay soil is highly effective in degrading applied hydrazine.

5103 Radioactive Materials Monitoring And Transport

REFER ALSO TO CITATION(S) 1751, 1758, 1766, 1782, 1783, 1788, 1789, 2673

2999 **(BFE—1980/7) Critical literature study on the cesium transfer feed/meat of domestic animals.** Fliegl, E.; Schelenz, R.; Fischer, E. (Bundesforschungsanstalt fuer Ernaehrung, Karlsruhe (Germany, F.R.). Zentrallaboratorium fuer Isotopentechnik). Nov 1980. 95p. (In German). Dep. NTIS (US Sales Only), MF A01. Order Number DE82750213.

A literature study concerning the transfer of cesium from feed to meat of domestic and wild animals has been carried out regarding approx. 3200 publications of the period 1950-1979. General criteria for the influence of experimental conditions on the transfer factor have been found. The transfer factor of radioisotopes of cesium is always smaller by one order of magnitude after single ingestion than after continuous administration until an equilibrium of incorporation to excretion is attained. The transfer factor of growing animals is greater than that of adult animals where transfer factor is not a function of age. The sex of the animals has no influence on the transfer factor. This value decreases with increasing weight of the animals. From these findings average transfer factors have been derived as follows: cattle 0.03 +- 0.02; calf 0.43 +- 0.06; goat 0.20; sheep 0.11 +- 0.02; pig 0.26 +- 0.01; hen 4.5; reindeer/caribou 0.31 +- 0.07; deer 0.18 +- 0.03. These values have been extracted from the original literature and relate mainly to animals undergoing metabolic experiments at equilibrium. Only the transfer factors of deer and caribou have been evaluated from data of the radiocesium concentration in feed and in meat.

3000 **(IAEA-R—2010-F) Preliminary study - by measurement in nature - of the desorption of metals attached to sediment probes. Final report for the period 1 June 1977 - 30 June 1979.** Caillot, A. (International Atomic Energy Agency, Vienna (Austria)). Nov 1979. vp. (In French). NTIS (US Sales Only), PC A09/MF A01. Order Number DE82702542.

The process of labelling by precipitation has recently been extrapolated to the double-labelling of fine particles. The first, "conservative" radioisotope (scandium-46 or hafnium-175+181) is fixed on the sediment particles in order to keep track of them in the natural environment. A second "reactive" radioisotope selected from among the pollutant elements (zinc-65, chromium-51 or mercury-203) is deposited at the same time on the same particles. This new technique is aimed at clarifying the mechanisms by which certain pollutant metal elements are redissolved during their entrainment by suspended sediments in a tidal estuary. A laboratory investigation has shown that hafnium or scandium hydroxide remains bound to the particles, whereas zinc hydroxide may be solubilized by certain chemical agents, particularly those present in estuaries in variable quantities, such as sodium chloride.

3001 **(INIS-mf—6935) Radionuclides in animal tissue samples from various regions of Austria.** Tatzber, F. (Vienna Univ. (Austria). Formal- und Naturwissenschaftliche Fakultaet). Jun 1981. 98p. (In German). NTIS (US Sales Only), PC A05/MF A01. Order Number DE82780800.

Thesis.

An investigation of the concentration of radioactive substances in animal species from various regions of Austria has been carried out. For bone and liver of deer, radionuclide concentrations typical for central Europe were found. The content of ^{90}Sr were higher in gastropod shells than in deer bone. Similar concentrations of ^{90}Sr were found in isopods as in snail shells related to fresh weight, but related to Ca content the values in isopods were higher than in all other animals. Based on these results, a study of snail shells and of isopods as bioindicators for ^{90}Sr content in environmental control is indicated. In tissue samples of the same species, but from different regions of Austria, the fallout radionuclide concentrations were found to be related to altitude (^{90}Sr) and to the amount of precipitation (^{137}Cs). These correlation differences could point to different deposition behaviours of ^{90}Sr and ^{137}Cs, the former being deposited mainly with solid precipitation. This seems plausible since aerosols carried over continental distances show a high sulfate content and alkaline earth metal sulfates are less soluble than alkali sulfates. Examination of absolute concentration values related to fresh tissue weight show high fallout radionuclide concentrations, as compared to natural radionuclide concentration, especially in hard tissues. These fallout levels constitute a significant radioactive load on the biosphere. Due to the long physical half-life of ^{90}Sr and ^{137}Cs, this situation will remain virtually unchanged during the next decades, even if no further nuclear weapons tests are carried out.

3002 **(Juel-Spez—105) Estimation of the environmental radiation burden from nuclear installations.** Kurz, P. (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Programmgruppe Kernenergie und Umwelt). Apr 1981. 144p. (In German). NTIS (US Sales Only), PC A07/MF A01. Order Number DE82903761.

Thesis. Submitted to Univ. of Essen, Germany.

A comparison is made of integral model and threshold models for determining the amount of radiation burden in the vicinity of nuclear installations. The models are analyzed qualitatively and quantitatively. Also presented are methods for computing radioisotope release to the environment. 28 references, 17 figures, 48 tables.

3003 **(KFK—3034) Behavior of plutonium in the environment of the Karlsruhe Nuclear Research Center.** Schuettelkopf, H. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Hauptabteilung Sicherheit; Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Projekt Nukleare Sicherheit). Aug 1981. 38p. (In German). Dep. NTIS (US Sales Only), MF A01. Order Number DE82750211.

The work described in this report aimed at the application of a sensitive Pu analysis to different environmental samples. In addition, the report represents first results about research on the radioecology of Pu in the environment of the Karlsruhe Nuclear Research Center. Pu-releases with the exhaust air from the Karlsruhe reprocessing plant were measured over more than two years. The contamination of the environmental air caused by fallout Pu and the mentioned Pu-releases were determined. Dispersion factors were calculated from these Pu-concentrations. The contamination of plants by Pu was measured. The velocity of Pu-aerosol deposition on grass was determined. Lichen and moss were found to be effective bioindicators for Pu in terrestrial ecosystems. The vertical distribution of Pu in different soils was measured. The contamination of organs of wild animals by Pu was determined. The Pu-contamination of the sediments of the Altrhein which serves as the main canal for liquid effluents from the Karlsruhe Nuclear Research Center was measured. The meat and shells of river mussels were analyzed for Pu and shells of the river mussels were identified as effective bionidicators for Pu in aquatic systems.

3004 **(KFK—3249) Determination of organically bound Tritium in environmental samples by application of the oxidizing plasma technique.** Strack, S.; Koenig, L.A. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Hauptabteilung Sicherheit). Dec 1981. 20p. Dep. NTIS (US Sales Only), MF A01. Order Number DE82750527.

From 22. annual meeting of the European Society of Nuclear Methods in Agriculture (ESNA); Aberdeen, UK (28 Sep - 3 Oct 1981).

The low-temperature oxidizing plasma technique with a suitable system for trapping the water formed in the oxidation process can be used to determine T bound organically in low-level samples. First, the samples are freeze-dried and the tissue water obtained in this way is measured, after distillation, in a liquid scintillation spectrometer. The residual dry matter is ashed in the reactor chamber of the plasma system. Oxidation takes place at temperatures not exceeding 200°C in an oxygen flow of about 40 ml/min. The water of oxidation is collected in a cold trap installed behind the reactor chamber. A volume of about 10 ml of water is sufficient to measure the tritium activity without enrichment. The oxidation behavior of various organic materials has been tested. Some first results of T concentrations in tissue water and the organic dry matter from food and plant samples collected in the vicinity of the Nuclear Research Center are presented. The method has the advantage that a commercially available instrument can be used requiring only little additional equipment. Handling is much less dangerous and contamination effects by atmospheric T can be easily kept at a minimum.

3005 **(NRPB-R—127) MARC - the NRPB methodology for assessing radiological consequences of accidental releases of activity.** Clarke, R.H.; Kelly, G.N. (National Radiological Protection Board, Harwell (UK)). Dec 1981. 14p. NTIS (US Sales Only), PC A02/MF A01; Also available from H.M. Stationery Office, price Pound2.00. Order Number DE82702546.

The National Radiological Protection Board has developed a methodology for the assessment of the public health related consequences of accidental releases of radionuclides from nuclear facilities. The methodology consists of a suite of computer programs which predict the transfer of activity from the point of release to the atmosphere through to the population. The suite of programs is entitled MARC; Methodology for Assessing Radiological Consequences. This report describes the overall framework and philosophy utilised within MARC.

3006 **(NUREG/CR—2625) Critical pathways of radionuclides to man from agro-ecosystems. Annual progress report Oct 80-Sep 81.** Smith, M.H.; Alberts, J.J.; Adriano, D.C.; McLeod, K.W.; Pinder, J.E. III. (Savannah River Ecology Lab., Aiken, SC (USA)). Apr 1982. 50p. NTIS, PC A03/MF A01.

The research describes the fate and behavior in the environment of radionuclides from nuclear fuel reprocessing. Greenhouse radionuclide uptake studies which examined factors possibly altering phyto-availability of radionuclides show only slight differences among crop species or soil treatments (lime or lime plus chelate) in Pu or Cm uptake. Field grown broadleaf crops grown have differing Pu concentrations associated with plant morphology, with some species exceeding the concentrations observed in wheat and soybean crops. Uranium contamination of a wheat crop grown near the separations facility appears to be strongly affected by root uptake. This is in contrast to the behavior of Pu where surficial pathways are the dominant modes of contamination, and is probably related to (1) the ubiquitous presence of naturally occurring U isotopes and (2) a greater concentration ratio for U than for Pu.

3007 **(PNL—3736, pp 4.1-4.D.5) Study 3 and Study 7: Hanford field measurement and field dosimeter response.** Haggard, D.L.; Cummings, F.M.; Endres, G.W.R.; Soldat, K.L. Aug 1982. NTIS, PC A13/MF A01.

In Hanford personnel dosimeter supporting studies FY-1981.

This study is a continuation of Study 4 performed in FY-1980 which evaluates radiological conditions at Hanford. The study also tries to identify areas in which analysis of dosimeter data from the Hanford Multipurpose Personnel Dosimeter (HMPD) could result in incorrect dose estimates to personnel. The specific factors investigated include field energy spectra and radiation type as well as a comparison of neutron dose estimates between several techniques of measuring neutron dose.

3008 **(PNL—4278) Dose assessment for sheep exposed to fallout from nuclear test Nancy.** Sasser, L.B.; Soldat, J.K.; Kennedy, W.E. Jr.; Murphy, D.W. (Pacific Northwest Lab., Richland, WA (USA)). Oct 1982. Contract AC06-76RL01830. 71p. NTIS, PC A04/MF A01. Order Number DE83001578.

Radiation doses were estimated for sheep wintering on Nevada ranges during the testing at the Nevada Test Site of the nuclear weapon Nancy on March 24, 1953. Exposure pathways considered were inhalation of radionuclides from both cloud passage and resuspension, external exposure of the total body and skin, and ingestion of contaminated forage and soil. Physiological, metabolic, and dosimetric data needed for these calculations were obtained from data appropriate for the sheep. Dose rate and radionuclide deposition values for shot Nancy were used. Radionuclide deposition and retention on the desert vegetation were obtained from data collected during several nuclear tests at the Nevada Test Site. Existing dosimetric computer programs, whose libraries were modified to include the sheep data, and specially developed models were used to estimate the dose commitment for the sheep. The total-body dose for reference sheep located within the 40-mR/hr (H+12) isopleth from all modes of exposure was estimated to be 2.6 rad. Ingestion of fallout on edible vegetation contributed the majority of the dose, whereas inhalation of radionuclides and consumption of contaminated soil from the ground contributed little to the internal doses. The dose to the thyroid of ewes from radioiodine and other radionuclides reaching the thyroid was approximately 400 rad. The calculated uniform dose to the reticulo-rumen was 4 rad; however, if fallout particles were assumed to concentrate in the ventral rumen, a localized dose of 200 rad could have been received by the rumen wall. Estimated dose to the bare skin of ewes was 120 rad. The dose to the fetal thyroid from radioiodine ingested by a pregnant ewe grazing at a location where the dose rate was 40 mR/hr (H+12) was estimated to be 700 rad, or approximately twice the dose to the maternal thyroid.

3009 **(SSI-A—82-02) Measuring stations for gamma radiation - measuring results 1981.** Kjelle, P.E. (Statens Straalskyddsinstitut, Stockholm (Sweden)). Feb 1982. 20p. (In Swedish). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702553.

The average values of gamma radiation as measured at five monitoring stations of the Institute during 1981 are presented. The results show some variation during the winter-season owing to the moderating effect of the snow.

3010 **(ORNL-tr—4896) Uranium content in food products.** Rezanov, I.I. Translated from *Voprosy Pitaniya ;* **28**: No. 2, 87-88(1969). Contract W-7405-ENG-26. 4p. NTIS, PC A02/MF A01. Order Number DE83000248.

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Fourteen types of food products were studied to determine their uranium contents; uranium was found in them in quantities on the order of 10^{-9} to 10^{-6}%. From among the animal products, the largest uranium content ($4.3 . 10^{-7}$%) was found in goose eggs.

3011 **(ORNL-tr—4889) Distribution of naturally occurring radionuclides of the uranium series: ^{226}Ra content of some foods.** Kuroda, T. Translated from *Igaku To Seibutsugaku ;* **76**: 31-33(10 Jan 1968). Contract W-7405-ENG-26. 4p. NTIS, PC A02/MF A01. Order Number DE82021374.

The ^{226}Ra content was measured in foods produced in the Sancho-machi area in the Tottori Prefecture, including Kurayoshi City and Josaibara Village of the Okayama Prefecture, and the Okayama City vicinity. ^{226}Ra content was also measured in the daily diet taken by people in these areas. A comparative study was done on the values measured.

3012 **(ORNL-tr—4903) Relationship between the radium content in vegetables and cereal crops and its concentration in the soil.** Mukhin, I.E.; Pavlova, Zh.K.; Nagovitsina, L.I. Translated from *Voprosy Pitaniya ;* **24**: No. 2, 11-14(1965). Contract W-7405-ENG-26. 9p. NTIS, PC A02/MF A01. Order Number DE82021270.

The concentration of radium was studied in the most widespread foodstuffs of plant origin with simultaneous analysis of soil taken from the four different regions where the vegetables and grain crops are grown. It was found that in some regions soils contain radium in concentrations of $n . 10^{-9}$ Ci/kg (in the air dried state), and the foodstuffs grown on these soils contain $n . 10^{-9}$ Ci per 1 kg dry weight. The accumulation of radium in foodstuffs was not directly related to the concentration of this radioactive element in soils. The appearance of a relationship between concentration of radium in soil and in products is noted only in 2 out of 13 vegetables and cereal crops studied.

5105 Site Resource And Use Studies

REFER ALSO TO CITATION(S) 1591, 1592, 1593, 1723, 1757, 1762, 2386

3013 **(AD—801300/5) Engineer soil mechanics tests.** Bishop, J.A.; White, C.R.; Lowance, F.E. (Naval Civil Engineering Lab., Port Hueneme, CA (USA)). Feb 1952. 43p. NTIS, PC A03/MF A01.

An engineering soils investigation of the area in which test structures were located was conducted to determine the physical characteristics and properties of the foundation soil. A soil-boring program was undertaken for the purpose of securing samples for laboratory examination and analysis. Mechanical analysis or grain-size distribution, specific-gravity determinations, direct shear and triaxial compression tests and moisture-density relationships were made on the resulting disturbed and remolded samples.

5106 Regulations

REFER ALSO TO CITATION(S) 2394

52 ENVIRONMENTAL SCIENCES, AQUATIC

5201 Basic Studies

REFER ALSO TO CITATION(S) 1650, 2076

3014 **(CONF-8110239—1) Frequency analysis of aquatic habitat: a procedure for determining instream flow needs.** Sale, M.J.; Railsback, S.F.; Herricks, E.E. (Oak Ridge National Lab., TN (USA); Illinois Univ., Urbana (USA). Dept. of Civil Engineering). 1981. Contract W-7405-ENG-26. 7p. NTIS, PC A02/MF A01. Order Number DE83001966.

From American Fishery Society symposium on acquisition and utilization of aquatic habitat inventory; Portland, OR, USA (28 Oct 1981).

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Minimum flow recommendations can be improved by analyzing the natural habitat variability in lotic environments. Habitat modeling techniques such as the Incremental Methodology can be combined with stream flow records to generate habitat frequency curves that are useful in determining instream flow needs.

3015 **(INIS-mf—6728) Determination of the residence time of rain water in some hydrographic basins by means of stable isotopes.** Goncalves, A.R.L. (Sao Paulo Univ., Piracicaba (Brazil). Escola Superior de Agricultura Luiz de Queiroz). Oct 1979. 106p. (In Portuguese). NTIS (US Sales Only), PC A06/MF A01. Order Number DE83780003.

Thesis.

Samples of rain-and river water, monthly collected during one year from ten stations of the Amazon basin analysed in their ^{18}O and D content. The residence time of rain water for each station was determined using the values of Δ^{18}O(‰) and ΔD(‰). The values of Δ^{18}O(‰) were correlated with the precipitation ones (mm) in order to determine the occurence of 'amount effect' in the stations. An analysis of samples was done along the Amazon River for simple observation of the 'isotopic fractionation' phenomenon the values of Δ^{18}O(‰). (Author).

3016 **(PB—82-195942) Environmental assessment of the Alaskan Continental Shelf. Final reports of principal investigators. Volume 8. Biological Studies.** (Alaska Univ., College (USA). Geophysical Inst.). Feb 1981. 367p. NTIS, PC A16/MF A01.

Invertebrate investigations were conducted in the Simpson Lagoon area on the Alaskan Beaufort Sea coast during the open-water seasons of 1977 and 1978 and during the winter of 1978-1979. The research concentrated on those organisms identified as important food items for animals at higher trophic levels (fish and birds). The main objective of the research was to study the seasonal and habitat distributions, abundances and biomasses, and life histories of these important invertebrates.

3017 **"A ground water resources study of a Pacific Ocean atoll - Tarawa, Gilbert Islands," by J. W. Lloyd, J.C. Miles, G. R. Chessmand, and S. F. Bugg.** Wheatcraft, S.W. (Desert Reseach Inst., Reno, NV); Buddemeier, R.W. *Water Resources Bulletin;* **17**: No. 5, 898(Oct 1981).

Several inherent problems in the methodology employed in the ground water resource study of Tarawa Atoll (Lloyd, et al., 1981) are described. Studies of Enewetak Atoll have provided data that require a significantly different conceptual model of the atoll hydrogeology system. Comparison of well, lagoon, and ocean tidal observations with a mathematical model that assumes horizontal tidal propagation indicates that the observed results are more consistent with a system that is controlled by vertical coupling between the unconsolidated surface aquifer and an underlying aquifer of more permeable limestone. This indicates that most fresh water recharged to the aquifer migrates downward and mixes with the sea water in a deeper aquifer providing easy exchange with the ocean. Lloyd, et al., do not take tidal mixing or vertical transport

into account and it therefore seems likely that fresh water inventories are significantly overestimated. Failure to include these significant loss terms in the island water budget may also account for calculated heads above ground level. (JMT)

5202 Chemicals Monitoring And Transport

REFER ALSO TO CITATION(S) 1574, 1575, 1590, 1650, 1651, 1652, 1677, 2075, 3016, 3025, 3092

3018 **(CONF-8110104—5) Fate of trace metals in the sediments of the New York Bight. Environmental Sciences Division Publication No. 2035.** Krom, M.D.; Turekian, K.K.; Cutshall, N.H. (Wesleyan Univ., Middletown, CT (USA). Dept. of Earth and Environmental Sciences; Yale Univ., New Haven, CT (USA). Dept. of Geology and Geophysics; Oak Ridge National Lab., TN (USA)). 1981. Contract W-7405-ENG-26. 83p. NTIS, PC A05/MF A01. Order Number DE83001896.

From 3. international ocean dumping symposium; Woods Hole, MA, USA (12 Oct 1981).

The available measurements of trace metal concentrations in the sediments of the New York Bight (NYB) were assembled with the aim of understanding their fates in this humanly impacted coastal system. The raw data assembled included more than 8000 determinations of 16 trace elements from 1000 stations in the Bight. Where available, additional relevant data such as grain size, total organic carbon (TOC), and loss on ignition (LOI) were also assembled. The major sources of trace metals to the Bight are polluted dredged material, sewage sludge, and wastewaters delivered by barges, rivers, runoff, and atmospheric precipitation and deposition. Whatever the source, it is clear that many of the trace metals are sequestered on particles and removed to the sediment rapidly. Shelf transport may occur before and after deposition. In the Bight apex, which includes the dumpsites, there is a very high (often > 0.9) correlation of the concentrations of each of the trace metals examined (Zn, Cr, Cu, Pb, Ni, Fe, Hg, Cd) with measures of organic matter concentrations in the silt-plus-clay percentage of the sediment. The best estimates for trace metal fluxes to the sediment suggest that sewage sludge may be the most important source, though all three sources (sewage sludge, dredged material, and airborne particulates) have fluxes that are of a similar order of magnitude (10^8 g/y).

3019 **(CONF-8205127—1) Petroleum hydrocarbons in stormwater runoff and municipal wastes: input to coastal waters and fate in marine sediments.** Eganhouse, R.P.; Blumfield, D.L.; Kaplan, I.R. (California Univ., Los Angeles (USA)). 1982. Contract AT03-76EV70134. 35p. NTIS, PC A03/MF A01. Order Number DE83001318.

From International symposium on chemistry of the Mediterranean - transport and reactivity of pollutants in the estuary; Primosten, Croatia, Yugoslavia (6 May 1982).

Portions of document are illegible.

Urban stormwaters, municipal wastes and waste-affected ocean sediments were sampled and then analyzed for their hydrocarbon content and composition. The hydrocarbon concentrations in runoff are highly variable ranging from 1 to 20 mg/liter and making up approximately 60% of the total extractable organic matter. Wastewater hydrocarbon concentrations are of similar magnitude. (5 to 23 mg/liter), however, the temporal variability is much lower. Estimates for the mass emission rates of runoff and wastewater hydrocarbons to the ocean in southern California are 9700 and 17,400 metric tons/year, respectively. Thus, municipal effluents contribute almost twice the amount of oil to coastal waters as does rainfall runoff in this region. Compositionally, the hydrocarbons in both sources resemble a mixture of various petroleum products, biogenic components being, at most, minor constituents. However, a group of synthetic compounds (the $C_{10\ 14}$ alkyl-substituted benzenes) related to the LAS-type surfactants, are ubiquitious constituents in southern California wastewaters. Owing to their unique origin, these molecules may be used for tracing domestic effluents into the environment. They appear to survive waste treatment and are well preserved in sediments adjacent to a major sewage outfall system.

3020 **(GKSS—81/E/29) Ozone oxidation of organic compounds in water.** Reinhardt, K.H.; Mueller, H.J. (GKSS-Forschungszentrum Geesthacht G.m.b.H., Geesthacht-Tesperhude (Germany, F.R.)). 1981. 4p. (In German). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82750212.

A report is given on the effect of water pollution upon drinking water production caused by materials of poor digestibility, the standard of ozone application for oxidizing these pollutants and on it's efficiency and limitations. Test results of a newly developed catalyst are presented.

3021 **(PNL-SA—10423) Performance testing of the sediment-contaminant transport model, SERATRA, at different rivers.** Onishi, Y.; Yabusaki, S.B.; Kincaid, C.T. (Pacific Northwest Lab., Richland, WA (USA)). Apr 1982. Contract AC06-76RL01830. 11p. (CONF-820881—1). NTIS, PC A02/MF A01. Order Number DE83002029.

From ASCE hydraulics speciality conference; Jackson, MS, USA (17 Aug 1982).

Mathematical models of sediment-contaminant migration in surface water must account for transport, intermedia transfer, decay and degradation, and transformation processes. The unsteady, two dimensional, sediment-contaminant transport code, SERATRA (Onishi, Schreiber and Codell 1980) includes these mechanisms. To assess the accuracy of SERATRA to simulate the sediment-contaminant transport and fate processes, the code was tested against one-dimensional analytical solutions, checked for its mass balance, and applied to field sites. The field application cases ranged from relatively simple, steady conditions to unsteady, nonuniform conditions for large, intermediate, and small rivers. It was found that SERATRA is capable of simulating sediment-contaminant transport under a wide range of conditions.

3022 **(UCID—19564) LLNL groundwater quality: sampling of seven shallow wells on the LLNL site.** Rogers, L.L. (Lawrence Livermore National Lab., CA (USA)). 17 Sep 1982. Contract W-7405-ENG-48. 43p. NTIS, PC A03/MF A01. Order Number DE83001844.

The Lawrence Livermore National Laboratory (LLNL) Site Hydrogeologic Investigation was initiated to evaluate the effect that the LLNL operations have on local groundwater quality. A task of the first phase of the investigation was to characterize the existing groundwater quality beneath the site. Seven shallow water table wells from the LLNL groundwater observation network were sampled. Four of the wells were sampled using a submersible centrifugal pump, and the other three were sampled by means of a bailer. A variety of analyses were performed including determinations of major cations and anions, total dissolved solids, total organic carbon, trace organic compounds (including two polychlorinated biphenyl analyses), gamma spectra, and tritium content. The analyses add useful resolution to the regional picture of groundwater quality and suggest some alterations of previous geochemical mapping. No contaminants were detected in any of the samples that would preclude the use of the water below the LLNL site for drinking.

3023 **(RFP-Trans—325) Ferrite method for treatment of wastewater from municipal incinerators.** Ueda, M. Translated from *Kankyo Shisetsu ;* No. 3, 44-48(1981). Contract AC04-76DP03533. 10p. NTIS, PC A02/MF A01. Order Number DE82021723.

Portions of document are illegible.

The Tsutsumine Purification Plant in Kawasaki is an incinerating facility with a capacity of 600 t/d (two incinerator units x 300 t/d). The antipollution measures adopted when the plant was being designed were the cement-solidification method for ashes from the electrostatic precipitator, and the wet-scrubbing method for removal of hydrogen chloride. The wastewater from the scrubber for hydrogen chloride removal contains heavy metals, albeit in extremely low concentrations. The ferrite technique is explained in this article.

3024 **(RFP-Trans—326) Ferrite precipitation technique for removing heavy metals from wastewater.** Takada, T. Translated from *Kagaku Kyoiku ;* **28**: 95-99(1980). Contract AC04-76DP03533. 14p. NTIS, PC A02/MF A01. Order Number DE82021722.

Portions of document are illegible.

Several heavy metals can be removed simultaneously from wastewater using the ferrite precipitation method. First, a suitable quantity of ferrous sulfate ($FeSO_4.7H_2O$) is added to wastewater containing heavy metals. Alkali is also added, and the water is heated to 60 to 70°C to cause atmospheric oxidation. As a result, the heavy metal ions become incorporated in the crystals of strongly magnetic spinel ferrite, with which they are precipitated and magnetically separated. Examples are given of treatment of wastewater from a university laboratory and a municipal waste incineration plant.

5203 Radioactive Materials Monitoring And Transport

REFER ALSO TO CITATION(S) 1756, 1789, 2992, 3002, 3003, 3005, 3009, 3021

3025 **(AERE-EMS—(82)-01) Laboratory experiments to investigate radionuclide enrichment in the sea-surface microlayer.** Hickmott, S.J.B. (UKAEA Atomic Energy Research Establishment, Harwell. Environmental and Medical Sciences Div.). Feb 1982. 15p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702540.

Samples of simulated seawater, and seawater from the Irish Sea, were contained in a plastic tank in the laboratory, and bubbles were passed through them to burst at the water surface. The emitted jet droplets, as representing the surface microlayer, were collected on filter papers. Such measurements are easier to perform than similar measurements at sea, and the lack of waves enables greater collection efficiencies to be obtained. The droplet samples were analysed for stable Na, ^{137}Cs and actinides, and compared with the concentrations in the bulk tank water, in order to examine possible concentration factors for radionuclides in the surface microlayer.

3026 **(DOE/EV/12529—21) Plutonium, cesium, uranium, and thorium series radionuclides in the Hudson River estuary and other environments. Annual technical progress report, December 1, 1981-November 30, 1982.** Simpson, H.J.; Trier, R.M.; Anderson, R.F. (Columbia Univ., Palisades, NY (USA). Lamont-Doherty Geological Observatory). 1982. Contract AC02-76EV12529. 51p. (COO—2529-21). NTIS, PC A04/MF A01. Order Number DE83001414.

Radionuclide activities were measured in a large number of sediment cores and suspended particle samples throughout the salinity range of the Hudson River estuary. Activities of ^{137}Cs, ^{134}Cs and ^{60}Co determined by gamma spectrometry and $^{239,240}Pu$ and ^{238}Pu determined by alpha spectrometry indicate reasonably rapid accumulation rates in the sediments of marginal cove areas, and very rapid deposition in the harbor region adjacent to New York City, resulting in $^{239,240}Pu$ accumulations there more than an order of magnitude greater than the fallout delivery rate. Fallout $^{239,240}Pu$ moving downstream in the Hudson appears to be almost completely retained within the system by particle deposition, while 80 to 90% of the ^{137}Cs derived from both reactor releases and fallout has been exported to the coastal waters in solution. Measurements of fallout $^{239,240}Pu$ in a saline lake with a high carbonate ion concentration yielded water column activities about two orders of magnitude greater than has been found for fallout plutonium in other continental waters, indicating extensive mobility in some natural water environments. Experiments using lake water suggest that carbonate ion is likely to be a critical factor in regulating plutonium solubility in some environments and that low molecular weight complexes are primarily responsible for enhanced plutonium solubility. Activities of several other nuclides of interest in radioactive waste management (^{238}U, ^{234}U, ^{232}Th, ^{230}Th, ^{228}Th, ^{231}Pa) were also found to be orders of magnitude greater in high carbonate waters than in other natural waters.

3027 **(PB—82-205428) Tritium in natural waters in the area of ispra (tritio in acque naturali della zona di ispra).** Cazzaniga, R.; Dominci, G. (Commission of the European Communities, Ispra (Italy). Joint Research Centre). [nd]. 31p. NTIS PC E03/MF E03.

The nuclear reactor in Ispra is cooled by heavy water, a small amount of which finds its way into the environment of the Establishment; losses also occur by evaporation and as steam. Besides Lake Maggiore, there are three other lakes in the immediate vicinity of Ispra. An automatic low level liquid scintillation counter was used for radioactivity measurements. All the calculations were performed to obtain the condition of maximal sensitivity by optimization of the significant figure. The tritium concentration in surface water, rainfall and potable water reservoirs in the Ispra area was monitored in 1977, 1978 and 1979, and these measurements are presented.

5204 Thermal Effluents Monitoring And Transport

3028 **(GKSS—81/E/51) Thermal impact assessment model with measured field data applied to the tidal river Weser.** Haeuser, J.; Eppel, D.; Mueller, A.; Nehlsen, A.; Tanzer, F. (GKSS-Forschungszentrum Geesthacht G.m.b.H., Geesthacht-Tesperhude (Germany, F.R.)). 1981. 21p. Dep. NTIS (US Sales Only), MF A01. Order Number DE82750561.

This paper presents the fundamental principles, the general outline, and a specific application of the model UTRANS (unified transport system) with emphasis on the results of application. The model simulates the temperature distribution, generated by the nuclear power plant KKU (1300 MWsub(e)), in the lower Weser river (within tidal cycle) for october 3, 1979. The model was run for a period of 24 hours. The solution area of some 15 kilometers (km 44 to km 59) consists of about 1100 discrete elements (DE) of variable size and irregular shape.

3029 **(PB—82-180316) Coupled near and far field thermal plume analysis using finite element techniques. Final report.** Kaufman, J.T.; Adams, E.E. (Massachusetts Inst. of Tech., Cambridge (USA). Energy Lab.). Oct 1981. 127p. (MIT-EL—81-036). NTIS, PC A07/MF A01.

The use of the open cycle cooling process for thermal power plants requires significant effluent discharges into aquatic environments. Both engineering and environmental considerations require accurate prediction of resulting temperature distribution in the receiving waters. Most predictive models have looked at one of two distinct regions of the discharge--the near or the far field--to the neglect of the other. A methodology is developed in this work to combine the attributes of both near and far field models. A finite element far field code is used which calculates both the circulation and heat distribution over a large area of the domain. From the far field coarse grid, a semi-circular area is removed which corresponds to the near field region of the discharge. At the new edge of the domain, which represents the near-far field boundary, mass flux and temperature boundary conditions are specified which simulate both the discharge into and entrainment out of the domain resulting from the surface discharge jet.

5205 Site Resource And Use Studies

REFER ALSO TO CITATION(S) 1586, 2077, 3092

3030 **(PB—82-192220) A climatology and oceanographic analysis of the California Pacific Outer Continental Shelf region. Final report.** Williams, R.G.; Reeves, R.W.; Godshall, F.A.; Fehler, S.W.; Pytlowany, P.J. (National Oceanic and Atmospheric Administration, Washington, DC (USA). Environmental Data and Information Service). Sep 1980. 1096p. NTIS, PC A99/MF E05.

The results of an environmental study of the California Pacific Offshore Continental Shelf (CPOCS) region are presented. The CPOCS region is defined as the area between the Mexican border to the Oregon State boundary and seaward to the shelf edge or 200 km. A larger region was examined in several components of

the study to describe conditions upstream and downstream of potential leasing areas. Individual chapters focus on meteorological factors, ocean circulation, water masses and physical properties, nutrient chemistry and water elevations.

5206 Regulations

REFER ALSO TO CITATION(S) 2394

3031 **(DOE/RA/50404—1232-App.D-Vol.4) Water supply and yield analysis. Final technical report, November 1980-May 1982.** (WyCoalGas, Inc., Douglas, WY (USA)). 1982. Contract FC02-81RA50404. 534p. NTIS, PC A23/MF A01. Order Number DE83001057.

Portions of document are illegible.

This volume consists of an IBM printout of all available data covering all Wyoming water rights of both adjudicated and unadjudicated records as of October 2, 1981. A few pages of text explain the information in the printout. (LTN)

3032 **(DOE/RA/50404—1232-App.D-Vol.5) Water supply and yield analysis. Final technical report, November 1980-May 1982.** (WyCoalGas, Inc., Douglas, WY (USA)). 1982. Contract FC02-81RA50404. 510p. NTIS, PC A22/MF A01. Order Number DE83001058.

Portions of document are illegible.

Appendix D-Volume 5 consists in entirety of an IBM printout of Wyoming water rights as of October 2, 1981. No text. (LTN)

53 ENVIRONMENTAL-SOCIAL ASPECTS OF ENERGY TECHNOLOGIES

REFER ALSO TO CITATION(S) 2383, 2392, 2393

5301 Social And Economic Studies

REFER ALSO TO CITATION(S) 2073

5302 Assessment Of Energy Technologies

REFER ALSO TO CITATION(S) 2073, 2336, 2962, 3092

3033 **(CONF-8110238—1) Qualitative factors in risk analysis. Workshop summary.** Lever, W.E. (Oak Ridge National Lab., TN (USA)). 1981. Contract W-7405-ENG-26. 4p. NTIS, PC A02/MF A01. Order Number DE83001893.

From DOE statistical symposium; Upton, NY, USA (28 Oct 1981).

Portions of document are illegible.

This study found that definitions of risk analysis works only in a restricted scientific environment where assumptions are fairly uniform. Participants thought the public arena would never have a uniform perception of risk. Problem areas were addressed. (PSB)

3034 **(DOE/EV/10023—T1) Impact of state environmental laws and regulations on emerging energy technologies.** Wellborn, S. (Booz-Allen and Hamilton, Inc., Bethesda, MD (USA). Energy and Environment Div.). 8 May 1979. Contract AC03-79EV10023. 52p. NTIS, PC A04/MF A01. Order Number DE82022304.

Portions of document are illegible.

The purpose of this study was to assess the impact of state environmental requirements on several emerging energy technologies. Specifically, the study focuses on the regulations of nine states and five technologies. The states are California, Colorado, Illinois, Kentucky, Louisiana, Texas, Utah, West Virginia, and Wyoming. The technologies are coal liquefaction, enhanced gas recovery, coal gasification, enhanced oil recovery, and oil shale. In general, the preliminary findings of this study are that requirements at the state level do not cause an excessive burden for emerging energy technologies such that facilities must contend with lengthy delays for permitting, duplicative or overlapping requirements, or exceptionally stringent standards which would preclude their location and development. In distinction to state requirements, however, Federal regulations are onerous, according to facilities interviewed throughout the nine states.

3035 **(KFK—3266) Contribution to a comparative environmental impact assessment for radiation exposure from the use of coal and nuclear energy for electricity generation.** Halbritter, G.; Braeutigam, K.R.; Fluck, F.W.; Lessmann, E.; Neumann-Hauf, G. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Abt. fuer Angewandte Systemanalyse). Jan 1982. 143p. (In German). NTIS (US Sales Only), PC A07/MF A01. Order Number DE82750589.

The emissions from a model coal unit and from all relevant stages of a model nuclear fuel cycle (PWR) were compiled. For assessing radiation exposure a comparison of the model coal unit and the nuclear fuel cycle on the basis of local and collective exposure values was performed. A risk-specific comparison can only be made on the basis of collective dose commitment calculations. The collective dose equivalents for German siting and licensing conditions were made on the basis of results presented by UNSCEAR. These calculations comprise local, regional, and global expositions for the plants under normal operation. The estimates show a reduction of the collective dose equivalent for the nuclear fuel cycle from about 40 (gonads) to about 20 (effective) person-Sv/(GWe x a); for the coal-fired unit the estimates yield 4 (effective) as compared to 0.6 (gonads) person-Sv/(GWe x a) in the UNSCEAR report. A great part of the radiation exposure from the nuclear fuel cycle is caused by the global exposure of carbon-14, building up over the regarded exposure time of 500 years. On the local and regional scale, the radiation exposure due to the emissions from coal-fired units is comparable to the non-occupational radiation exposure from all relevant stages of the nuclear fuel cycle at normal operation. For a comprehensive risk estimate of the nuclear fuel cycle also accidental radiation exposure must be considered. Normal operation and accidental risk are compared on the detriment level, showing that the risk contribution from accidents is about twice that from normal operation.

3036 **(ORNL—5911) Preparation of environmental analyses for synfuel and unconventional gas technologies.** Reed, R.M. (ed.). (Oak Ridge National Lab., TN (USA)). Sep 1982. Contract W-7405-ENG-26. 210p. NTIS, PC A10/MF A01. Order Number DE83001718.

Government agencies that offer financial incentives to stimulate the commercialization of synfuel and unconventional gas technologies usually require an analysis of environmental impacts resulting from proposed projects. This report reviews potentially significant environmental issues associated with a selection of these technologies and presents guidance for developing information and preparing analyses to address these issues. The technologies considered are western oil shale, tar sand, coal liquefaction and gasification, peat, unconventional gas (western tight gas sands, eastern Devonian gas shales, methane from coal seams, and methane from geopressured aquifers), and fuel ethanol. Potentially significant issues are discussed under the general categories of land use, air quality, water use, water quality, biota, solid waste disposal, socioeconomics, and health and safety. The guidance provided in this report can be applied to preparation and/or review of proposals, environmental reports, environmental assessments, environmental impact statements, and other types of environmental analyses. The amount of detail required for any issue discussed must, by necessity, be determined on a case-by-case basis.

3037 **Conference on Environmental aspects of non-conventional energy resources - II.** Saint Clair, A.E. La Grange Park, IL; American Nuclear Society (1978). 628p. (CONF-780928—).

From ANS meeting on environmental aspects of non-conventional energy resources; Denver, CO, USA (26 Sep 1978).

The conference presents papers on such topics as solar energy, coal conversion, biomass and waste conversion, oil shale, indirect solar energy, energy storage and hydroelectric, and geothermal energy. A review of the environmental effects and benefits of solar technologies and siting considerations for solar thermal electric generating plants are given. Environmental investigations

of in situ coal classification experiments and environmental aspects of the DOE's underground coal conversion program are discussed. Environmental aspects of wood fuel are outlined along with social, economic, and legal implications of bioenergy and primary impacts of growing aquatic plants for energy. Emphasis is placed on geyser geothermal operations and other geothermal energy resources and their environmental aspects.

5303 Environmental Impact Statements

REFER ALSO TO CITATION(S) 2079

3038 **(DOE/EA—0155) Final environmental impact assessment of the Paducah Gaseous Diffusion Plant site, Paducah, Kentucky.** (Paducah Gaseous Diffusion Plant, KY (USA); Department of Energy, Oak Ridge, TN (USA). Oak Ridge Operations Office). Aug 1982. Contract W-7405-ENG-26. 252p. NTIS, PC A12/MF A01. Order Number DE83001211.

Portions of document are illegible.

This document considers: the need for uranium enrichment facilities; site location; plant description; and describes the power generating facilities in light of its existing environment. The impacts from continuing operations are compared with alternatives of shutdown, relocation, and alternative power systems. (PSB)

55 BIOMEDICAL SCIENCES, BASIC STUDIES

5501 Behavioral Biology

REFER ALSO TO CITATION(S) 2371, 2995

5502 Biochemistry

REFER ALSO TO CITATION(S) 1966

5503 Cytology

3039 **(DOE/EV/02040—T80) Use of lymphoblastoid cells for the estimation of environmental insults to DNA. Informal technical progress report.** Strauss, B. (Chicago Univ., IL (USA)). 14 Sep 1982. Contract AC02-76EV02040. 5p. NTIS, PC A02/MF A01. Order Number DE83000230.

Progress is reported on research in the following areas: (1) studies on the ability of lymphoblastoid cells to remove the alkylation adduct O^6 methylguanine from their DNA; (2) studies on the termination of DNA synthesis on carcinogen-damaged templates in an in vitro system; and (3) studies aimed at the transformation of xeroderma cells. (ACR)

3040 **(INIS-mf—7174) 2. Brazilian Congress on Cell Biology and 7. Brazilian Colloquium on Electron Microscopy - Abstracts.** (Sociedade Brasileira de Biologia Celular, Rio de Janeiro; Sociedade Brasileira de Microscopia Eletronica, Rio de Janeiro). 1980. 281p. (In Portuguese). (CONF-8007142—(Absts.)). NTIS (US Sales Only), PC A13/MF A01. Order Number DE83780006.

From 2. Brazilian congress on cell biology and 7. Brazilian colloquium on electron microscopy; Rio de Janeiro, Brazil (23 Jul 1980).

Immunology, virology, bacteriology, genetics and protozoology are some of the subjects treated in the 2. Brazilian Congress on Cell Biology. Studies using radioisotopic techniques and ultrastructural cytological studies are presented. Use of optical - and electron microscopy in some of these studies is discussed. In the 7. Brazilian Colloquium on Electron Microscopy, the application of this technique to materials science is discussed (failure analysis in metallurgy, energy dispersion, X-ray analysis, etc).

5505 Metabolism

3041 **(INIS-mf—7150) Metabolism of progesterone-4-^{14}C in organ cultures of fetal adrenal glands in the human being.** Weber, S. (Muenchen Univ. (Germany, F.R.). Fachbereich Medizin). 8 Feb 1979. 49p. (In German). NTIS (US Sales Only), PC A03/MF A01. Order Number DE83780008.

Thesis.

In 72 hours of incubation in two subsequent cultures, progesterone-4-^{14}C was converted into different corticosteroids and androgenes by using explants of the adrenal glands in organ cultures, which were taken from a male fetus with a crown-to-rump length of 8.5 cm. In the most cases the water-dilutable metabolites are steroidsulfates. The following individual progesterone metabolites were found: 17-hydroxyprogesterone-4-^{14}C, 16-hydroxyprogesterone-4-^{14}C, corticosterone-4-^{14}C, cortisole-4-^{14}C, cortisone-4-^{14}C, androstendione-4-^{14}C, and 11β-hydroxyandrostendione-4-^{14}C. These steroids let appear possible the presence and efficacy of the following enzyme systems: 17chemical bond-hydroxylase, 16chemical bond-hydroxylase, 21-hydroxylase, 11β-hydroxylase, 11β-hydroxysteroide-dehydrogenase, and Csub(17-20) desmolase. Calculations of our dates by the analogue computer, which are present by now, apparently seem to render possible the kinetic of the corticosteroide biosynthesis in the tissue of fetal adrenal glands by organ cultures, because under the present conditions incubations can be carried out for considerably longer periods than by cell fractions, cell homogenates, and organ sections.

5506 Medicine

REFER ALSO TO CITATION(S) 1829, 2905, 3068, 3074, 3078, 3079, 3084, 3102

3042 **(AD-A—112090/6) Remote Medical Diagnosis System (RMDS) Advanced Development Model (ADM) radiology performance test results. Technical report oct 78-apr 79.** Rasmussen, W.T.; Hayes, P.D.; Gerber, F.H.; Kuhlman, J.A.; Hutzelman, F.W. (Naval Ocean Systems Center, San Diego, CA (USA)). Dec 1981. 120p. (NOSC/TR—683). NTIS, PC A06/MF A01.

A report is given of tests conducted to obtain qualitative and quantitative (statistical) data on radiology performance of the RMDS Advanced Development Models (ADMs). Data were obtained on findings confidence levels, diagnostic confidence levels, overall clinical reading accuracy, radiologist system controls, and RMDS capabilities. It was concluded that the RMDS ADMs would provide satisfactory radiographic images for radiology consultations in emergency cases with gross pathological disorders but that a higher resolution would be required in the next evolution of RMDS for cases involving subtle findings.

3043 **(BNL—31849) New approach to 2D liner interpolation for geometric distortion correction of images.** Bizais, Y.J.C.; Rowe, R.W.; Zubal, I.G.; Bennett, G.W.; Brill, A.B. (Brookhaven National Lab., Upton, NY (USA)). 1982. Contract AC02-76CH00016. 4p. (CONF-820974—1). NTIS, PC A02/MF A01. Order Number DE83000213.

From 1. IEEE Computer Society international conference on medical computer science computational medicine; Philadelphia, PA, USA (23 Sep 1982).

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A new 2D interpolation procedure for geometric distortion correction of images is described, and shown to be applicable in the general case where the knots are arbitrarily located. This new method leads to a continuous interpolation function, contrary to the usual approach, and exhibits better performance.

3044 **(BNL—31911) PETT: quantitative in vivo measurement of human function and metabolism.** Wolf, A.P. (Brookhaven National Lab., Upton, NY (USA)). 1981. Contract AC02-76CH00016. 23p. (CONF-8110233—1). NTIS, PC A02/MF A01. Order Number DE83000710.

From 4. Philip Morris science symposium; Richmond, VA, USA (29 Oct 1981).

A brief review is given of positron emission transaxial tomography (PETT), the nature of the analytical technique and its instrumentation, materials and techniques for applying the instrument, and some results of its use. (ACR)

3045 **(DOE/ER/60033—3) Nuclear medicine and imaging research: instrumentation and quantitative methods of evaluation. Comprehensive progress report, January 1, 1980-January 14, 1983.** Beck, R.N.; Cooper, M.C. (Franklin McLean Memorial Research Inst., Chicago, IL (USA)). Jul 1982. Contract AC02-82ER60033. 60p. NTIS, PC A04/MF A01. Order Number DE83000231.

Portions of document are illegible.

Progress is reported for the period January 1980 through January 1983 in the following project areas: (1) imaging systems in nuclear medicine and image evaluation; and (2) methodology for quantitative evaluation of diagnostic performance. (ACR)

3046 **(FRNC-TH—1064) Dosimetry in radiodiagnosis. Individual irradiation card. Dosimetric application of electrets.** Lisbona, A. (Toulouse-3 Univ., 31 (France)). Sep 1981. 88p. (In French). NTIS (US Sales Only), PC A05/MF A01. Order Number DE82780801.

Thesis.

This study deals with a radiodiagnosis dosimetry, and contains two parts. First of all, the combination between a dosimetric data acquisition from an ionization chamber and a micro-computer allows the realization of individual irradiation card for a well established examination. The method is extensible to almost totality of radiological examinations. The second part describes the following of an original work about the application of electrets in radiodiagnosis dosimetry. At least a theorical study is shown; it takes account of different involving phenomena and allows a starting interpretation of experimental results.

3047 **(INIS-mf—6985) Radiopharmaceuticals.** (Isocommerz G.m.b.H., Berlin (German Democratic Republic)). 1981. 76p. NTIS (US Sales Only), PC A05/MF A01. Order Number DE82780793.

The catalogue offers a wide-spread product range which meets the requirements of the international trend of in vivo application of radiopharmaceuticals. It includes: (1) conditions of sale and delivery, (2) delivery schedule for radiopharmaceuticals, (3) technical information, (4) product specifications, and (5) the complete delivery programme.

3048 **(INIS-mf—7018) Quantitative radiological determination of calcium concentrations in the skeleton.** Reich, W. (Koeln Univ. (Germany, F.R.). Medizinische Klinik). 24 Mar 1980. 80p. (In German). NTIS (US Sales Only), PC A05/MF A01. Order Number DE82780768.

Thesis.

A simple and practical apparatus and method has been developed in which the Ca concentration in a region 2.5 mm wide in the centre of the middle phalanx of the fourth finger is determined by densitometric evaluation of X-ray pictures. The following results were obtained. Screen films were better suited for densitometric pictures than non-screen films. Two methods of printing were compared. The object of measurement and the object of reference must be similar, with regard to structure and material. An accurate determination of the content of lime salts is possible only with two biological objects of reference. In spite of standardized imaging techniques, there were deviations in radiation absorption higher than 20% with the screen film. This is assumed to be due to inconstant X-ray doses. The range of applications of the method is limited by irregularities of the X-ray screens and by imaging errors due to inconstant X-ray doses. Changes in the calcium content of the finger bones can be detected above a value of +-7%.

3049 **(INIS-mf—7021) Vertebral metastases of the mammary carcinoma. Recidivation after radiation therapy.** Huebsch, T. (Muenchen Univ. (Germany, F.R.). Klinik und Poliklinik fuer Radiologie). 14 Dec 1978. 48p. (In German). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82780770.

Thesis.

528 patients with carcinoma of the breast in the radiological clinic and polyclinic of the University of Munich were examined. 287 patients developed metastases during the observation period. In 174 cases, these were localized at the skeleton. Within the skeleton, the vertebral column and the iliosacral joints were affected in 147 cases. 120 of these 147 patients were irradiated on the affected regions. In 50 of these 120 cases, using the X-ray findings and the skeleton scintiscannings, relapses in the vertebral column could be found. 22 of these patients developed a relapse in the vertebral column in the first 3 months, in the 1st half year the rate was 72% and after a year even 90%. The average latency period until the development of the relapse in the vertebral column was 7.1 months. 20 patients were irradiated at the vertebral column and/or at the iliosacral joints twice, 9 of them were irradiated three times, one patient four and one patient five times. In most cases, the thoracic and the lumbar parts of the spine were irradiated, this was followed by the sacrum, the iliosacral joints, and the cervical vertebral. The average interval between the irradiations was 8 to 9 months. 74% of the irradiations had to be carried out during hospitalization, 26% could be carried out on outdoor patients. The results show that relapse developments after irradiation of a metastase at the vertebral column or at the iliosacral joints occur frequently and mean a considerable physical and psychic burden to the patient. Therefore it seems reasonable to recommend an irradiation of the whole vertebral column including the iliosacral joints in the first occurrence of a metastase in this region.

3050 **(LUNFD6/NFRA—1014/1-46/(1981)) Physical and physiological aspects of xenon isotopes in nuclear medical applicants.** Bolmsjoe, M. (Lund Univ. (Sweden). Radiofysiska Institutionen). Nov 1981. 132p. (LUMEDW/MERI—1014/1-46/(1981)). NTIS (US Sales Only), PC A07/MF A01. Order Number DE82702555.

A method for trapping radioactive xenon waste from nuclear medical departments has been investigated. Adsorption of xenon on activated charcoal was found to be an efficient trapping method. A large gain in capacity was found when the trap was refrigerated, and permitted a large number of patient investigations before breakthrough of xenon occurred. By heating charcoal traps to 250-350 degrees C, adsorbed xenon gas is freed and is thus made available for re-use. A technique for room-air monitoring of xenon-leakage from patient investigations is described, where the room-air is continously pumped through a small charcoal filter, mounted close to a detector. The low gammaenergy of Xe-133, 81 keV, introduces problems for in vivo measurements due to the small differences in the energies of the primary and Compton-scattered photons. Influence of scatter and of hemispheric cross-talk was studied for cerebral blood-flow measurements. It was shown that substantial artefacts are introduced in the calculation of regional gray matter flow. The applicability of the xenon-washout technique for liver blood-flow measurements in rat was investigated.

3051 **(NAS-NS—3201) Synthesis of carbon-11, fluorine-18, and nitrogen-13 labeled radiotracers for biomedical applications. Nuclear Science Series: Nuclear Medicine.** Fowler, J.S.; Wolf, A.P. (Brookhaven National Lab., Upton, NY (USA)). Sep 1982. Contract AC02-76CH00016. 131p. NTIS $11.25.

Carbon 11, Fluorine 18, and Nitrogen 13-labeled radiotracers are reviewed from the standpoint of synthetic organic chemistry while keeping in perspective the necessity of integrating the organic chemistry with the design and ultimate application of the radiotracer. The reactions used, the principles used to adapt these reactions to labeling with short-lived radionuclides, and the concepts of chemical reactivity form the framework upon which synthetic strategies for short-lived radiotracers are developed. Potentially new routes are suggested which may be applied to problems in labeling organic molecules. (ACR)

3052 **(PB—82-185158) A guide for the submission of initial reports on diagnostic x-ray systems and their major components. Final report.** (Bureau of Radiological Health, Rockville, MD (USA)). Jan 1982. 82p. (FDA/BRH—82/58). NTIS, PC A05/MF A01.

The guide outlines for a manufacturer, a format for the presentation of initial and supplemental reports on diagnostic x-ray systems and their major components which are subject to the Performance Standard 21 CFR 1020.30, 1020.31, and 1020.32. The guide attempts to identify the pertinent information needed by the Bureau of Radiological Health to fulfill its delegated responsibilities under the Radiation Control for Health and Safety Act of 1968 (PL 90-602). The guide asks for information in four parts: Part 100 - Identification, Part 200 - Component Description, Part 300 - Quality Control Testing, and Part 400 - Common Aspects. A table provides a reference to aid the manufacturer in readily identifying which sections of each part he must complete for the particular component(s) that he is reporting.

5507 Microbiology

3053 **(CONF-820858—2) Role of bacterial nutrition in bioprocess design.** Griffith, W.L.; Compere, A.L. (Oak Ridge National Lab., TN (USA)). 1982. Contract W-7405-ENG-26. 7p. NTIS, PC A02/MF A01. Order Number DE82022327.

From Technical Association of Pulp and Paper Industries conference; Asheville, NC, USA (30 Aug 1982).

Portions of document are illegible.

The liquid environment, or medium, in which microorganisms grow must supply both the necessary materials and the required energy for the synthesis of new cells and the maintenance of old cells. Major materials for cell construction include sources of carbon, nitrogen, phosphorus, sulfur, and trace elements. Where microorganisms are unable to synthesize a compound necessary for cell growth, the compound must also be supplied in the medium. Cells act as catalysts for the chemical reactions on which their growth is based. For this reason, it is possible to estimate their growth and activity as a function of those chemical reactions they mediate. This, coupled with estimates of kinetics, provides a method for simply modelling bioprocesses.

3054 **(DOE/ER—0147) Annual report and summaries of FY 1982 activities supported by the Division of Biological Energy Research.** (Department of Energy, Washington, DC (USA). Office of Energy Research). Oct 1982. 57p. NTIS, PC A04/MF A01. Order Number DE83001332.

The Biological Energy Research (BER) program was established to conduct fundamental studies in biology oriented towards energy conversion and conservation to underpin future developments in energy related biotechnology. The BER program aims at comprehending biological principles and mechanisms rather than the development of specific technological processes. Some examples of the research priority areas identified include: (1) definition of stress effects in plants at the biochemical and biophysical levels, and including adaptive mechanisms; (2) the bio-synthesis and biodegradation mechanisms of the key natural polymers, cellulose, lignin and other polysaccharides; (3) the development of better understanding of the genetics of those microbes responsible for degradations and fermentations, especially anaerobic microorganisms; (4) the physiological genetics and biochemistry of important processes in both plants and microbial species; and (5) interactive relationships between different species of organisms as with plant host-pathogens, microbial consortia, and plant-soil microbes with emphasis on recognition events, and reciprocal information and substrate flows. In addition to these areas the BER program maintains a significant stake in photosynthesis, and other energetics research, plant growth and development mechanisms, genetics of plant systems, microbiological studies on metabolic regulation, thermophily and other areas. Research project summaries are provided for each of the research tasks supported by BER during FY 1982 plus several which have been active this year, but funded from monies from previous fiscal years.

5520 Public Health

REFER ALSO TO CITATION(S) 3093

3055 **(LA—9465) Analysis of malignant melanoma incidence among employees at the Los Alamos National Laboratory from 1969 to 1978.** Acquavella, J.F.; Tietjen, G.L.; Wilkinson, G.S.; Key, C.R.; Voelz, G.L. (Los Alamos National Lab., NM (USA)). Aug 1982. Contract W-7405-ENG-36. 22p. NTIS, PC A02/MF A01. Order Number DE83000428.

The melanoma incidence from 1969 to 1978 among 11,308 workers at the Los Alamos National Laboratory was investigated. Six cases were detected in the total cohort, in which 5.69 cases would be expected based on incidence rates for New Mexico, specific for age, sex, and ethnicity. Among non-Hispanic men, 3 cases were identified, whereas 4.4 would be expected. A direct comparison with statewide incidence rates gave similar results, indicating that melanoma incidence is not excessive among Laboratory employees. Further, these findings suggest that the recent threefold melanoma excess reported for white male employees at the Lawrence Livermore National Laboratory is not likely related to occupational factors common to nuclear research facilities.

5530 Agriculture And Food Technology

REFER ALSO TO CITATION(S) 3099

3056 **(DOE/EV/10094—T1) Genetic and physiological aspects of radiation resistance and fitness in lepidopteran insects for use in autocidal control programs. Progress report, November 1, 1978-November 30, 1979.** LaChance, L.E.; Riemann, J.G.; Gassner, G.; Degrugillier, M.E. (Department of Agriculture, Fargo, ND (USA). Metabolism and Radiation Research Lab.). 1979. Contract AI01-79EV10094. 30p. NTIS, PC A03/MF A01. Order Number DE83000357.

Portions of document are illegible.

The status and rationale of the various projects are summarized. Projects include: (1) serological studies of Heliothis species and hybrids; (2) growth, survival and reproduction of hybrid and backcross males from H. virescens and H. subflexa crosses reared on diets containing antibiotics; (3) effects of heat shocks on growth, survival and reproduction of H. virescens; (4) sperm cell abnormalities in crosses between H. virescens and H. subflexa; and (5) sperm fragmentation in H. virescens. (ACR)

56 BIOMEDICAL SCIENCES, APPLIED STUDIES

5601 Radiation Effects

REFER ALSO TO CITATION(S) 1751, 2382, 2400, 2401, 2761, 2984, 2999, 3005, 3006, 3007, 3011, 3052

3057 **(AD-A—113804/9) Radiological and microwave protection at NRL, January 1981 - December 1981. Final report Jan-Dec 81.** Stone, J.N.; Johnson, T.L.; Luersen, R.B. (Naval Research Lab., Washington, DC (USA)). 22 Apr 1982. 30p. NTIS, PC A03/MF A01.

This report summarizes the administrative, operational, research, and consultative activities of the Health Physics Staff, Code 6070, for the calendar year 1981. The Staff has defined each of its major responsibilities and technical functions as programs or projects and periodically publishes the entire Program Summary-Progress Report. The last Program Summary-Progress Report was published in 1980 as NRL Memorandum Report 4523. The next one is scheduled for 1985. The index on page 7 of this report will identify specific Staff programs or projects by program number. The progress of each program or project during the last calendar year is included in the appropriately numbered paragraph.

3058 **(ANL—82-35) Division of Biological and Medical Research annual technical report, 1981.** Rosenthal, M.W. (ed.). (Argonne National Lab., IL (USA)). Jun 1982. Contract W-31-109-ENG-38. 160p. NTIS, PC A08/MF A01. Order Number DE83000920.

This report summarizes research during 1981 in the Division of Biological and Medical Research, Argonne National Laboratory. Studies in Low Level Radiation include comparison of lifetime effects in mice of low level neutron and gamma irradiation, delineation of the responses of dogs to continuous low level gamma irradiation, elucidation of mechanisms of radiation damage and repair in mammalian cells, and study of the genetic effects of high LET radiations. Carcinogenesis research addresses mechanisms of tumor initiation and promotion in rat liver, chemical carcinogenesis in cultured mammalian cells, and molecular and genetic mechanisms of chemical and ultraviolet mutagenesis in bacteria. Research in Toxicology uses a variety of cellular, whole animal, and chronobiological end points, chemical separations, and statistical models to evaluate the hazards and mechanisms of actions of metals, coal gasification by products, and other energy-related pollutants. Human Protein Index studies develop two-dimensional electrophoresis systems for diagnosis and detection of cancer and other disease. Biophysics research includes fundamental structural and biophysical investigations of immunoglobulins and key biological molecules using NMR, crystallographic, and x-ray and neutron small-angle scattering techniques. The final sections cover support facilities, educational activities, seminars, staff talks, staff, and funding agencies.

3059 (CERN—82-02, pp 41-68) **Observations on the biological foundations of dose limits.** Joffre, H.Y. (CEA Centre d'Etudes Nucleaires de Fontenay-aux-Roses, 92 (France). Inst. de Protection et de Surete Nucleaire). 1 Apr 1982. (In French). Dep. NTIS (US Sales Only).

From ATSR meeting on health physics; Geneva, Switzerland (12 Nov 1981).

In the present article the author examines a certain number of results of biological observations associated to external irradiations and arrives at following conclusions: For γ-radiation the results show an biological efficiency which is below the value of 10^{-4} rad^{-1} and which is equally sensitive to lower rates than the minimal dose. For X-radiation at the maximal dose rate of 30 rad/min the observed dose-effect relations are linear according to the CIPR model. For neutrons recently a revision of the estimations of the expositions of the survivants of the nuclear explosions at Japan was performed. The first published results of this revision lead to a dose-effect relationship of $D^{0.7}$ and a biological efficiency of low doses which is more important than the results of precedent estimations.

3060 (CERN—82-02, pp 164-181) **Practical implications of new recommendations of the ICRP.** Coulon, R. (CEA Centre d'Etudes Nucleaires de Fontenay-aux-Roses, 92 (France)). 1 Apr 1982. (In French). Dep. NTIS (US Sales Only).

From ATSR meeting on health physics; Geneva, Switzerland (12 Nov 1981).

The organization and the work of the International Commission of Radiological Protection is described. It concerns the definition of objects to be protected, the fundamental principles of protection, the concepts and the terminology, the limits of individual exposition, and the operational procedures.

3061 (CERN—82-02, pp 30-40) **Development of the personnel dosimetry in mixed radiation fields.** Hoefert, M. (European Organization for Nuclear Research, Geneva (Switzerland)). 1 Apr 1982. (In French). Dep. NTIS (US Sales Only).

From ATSR meeting on health physics; Geneva, Switzerland (12 Nov 1981).

The author gives a review about the dosimetry for different types of radiation at different energies.

3062 (CERN—82-02, pp 98) **Practical establishment for the measurement of the rate of the absorbed dose as function of the deepness in soft tissues.** Bardoux, R.; Joffre, H. (CEA Centre d'Etudes Nucleaires de Fontenay-aux-Roses, 92 (France). Inst. de Protection et de Surete Nucleaire). 1 Apr 1982. (In French). Dep. NTIS (US Sales Only).

From ATSR meeting on health physics; Geneva, Switzerland (12 Nov 1981).

3063 **(DOE/EV/03408—26) Physico-chemical studies of radiation effects in cells. Progress report, February 15, 1982-February 14, 1983.** Powers, E.L. (Texas Univ., Austin (USA). Lab. of Radiation Biology). 1982. Contract AS05-76EV03408. 19p. NTIS, PC A02/MF A01. Order Number DE83000300.

Progress in studies investigating the chemical mechanisms involved in radiation-induced cellular damage is reported. Three organisms currently being tested are Bacillus megaterium, Bacillus subtilis, and Escherichia coli, silver and mercury have been used as radiosensitizers, and their interaction with DNA studied. (ACR)

3064 **(INIS-mf—6987) Induction of thyroid-gland tumours by ionizing radiation.** van Daal, W.A.J. (Rijksuniversiteit Leiden (Netherlands)). 28 Oct 1981. 129p. (In Dutch). NTIS (US Sales Only), PC A07/MF A01. Order Number DE82780769.

Thesis.

The study reported in this thesis formed part of an investigation on radiation-induced tumours in a sample of the patients given radiation therapy in the head and neck region for benign diseases at the Leiden University Hospital between 1932 and 1963. To find out whether it would be useful to trace and examine all patients, a random sample comprising 25% of the irradiated cohort was examined for (induced) tumours of the skin, mouth and throat, and the thyroid and parathyroid glands. The present study was confined to induced tumours of the thyroid gland. The literature is reviewed and analysed and the study described. With respect to the scientific aspects, it may be concluded that if the duration of followup is not taken into account, the prevalence of thyroid gland nodules and non-occult carcinomas in the surviving Leiden patients is roughly the same as that found in comparable studies done elsewhere, but for equivalent follow-up periods the incidence of both nodules and carcinomas is much lower for Leiden.

3065 **(INIS-mf—6999) Dosimetry and biological effects of fast neutrons.** Zoetelief, J. (Amsterdam Univ. (Netherlands)). 4 Nov 1981. 177p. NTIS (US Sales Only), PC A09/MF A01. Order Number DE82780757.

Thesis.

This thesis contains studies on two types of cellular damage: cell reproductive death and chromosome aberrations induced by irradiation with X rays, gamma rays and fast neutrons of different energies. A prerequisite for the performance of radiobiological experiments is the determination of the absorbed dose with a sufficient degree of accuracy and precision. Basic concepts of energy deposition by ionizing radiation and practical aspects of neutron dosimetry for biomedical purposes are discussed. Information on the relative neutron sensitivity of GM counters and on the effective point of measurement of ionization chambers for dosimetry of neutron and photon beams under free-in-air conditions and inside phantoms which are used to simulate the biological objects is presented. Different methods for neutron dosimetry are compared and the experimental techniques used for the investigations of cell reproductive death and chromosome aberrations induced by ionizing radiation of different qualities are presented. Dose-effect relations for induction of cell inactivation and chromosome aberrations in three cultured cell lines for different radiation qualities are presented.

3066 **(INIS-mf—7006) Re-initiation repair in bacteriophage T4.** Cupido, M. (Rijksuniversiteit Leiden (Netherlands)). 19 Nov 1981. 106p. NTIS (US Sales Only), PC A06/MF A01. Order Number DE82780758.

Thesis.

Irradiation of bacteriophage T4 with ultraviolet light induces the formation of pyrimidine dimers in its DNA. These dimers hamper replication of DNA and, to a lesser extent, transcription of DNA after its infection of bacteria. A number of pathways enable phage T4 to multiply dimer-containing DNA. One of these pathways has been named replication repair and is described in this thesis. The properties of two phage strains, unable to perform replication repair, have been studied to obtain a picture of the repair process. The mutations in these strains that affect replication repair have been located on the genomic map of T4.

3067 **(INIS-mf—7015) Morphological studies on the effects of X-radiation on the embryonic tissue in mice. Especially considering the so-called cytotoxic effect.** Park, W. (Freie Univ. Berlin (Germany, F.R.). Inst. fuer Toxikologie und Embryonalpharmakologie). 26 Jun 1980. 103p. (In German). NTIS (US Sales Only), PC A06/MF A01. Order Number DE82780759.

Thesis.

Pregnant mice of the day 10 + 2 have been irradiated with X-rays, the doses being 50, 100, and 200 R. The embryos have been taken 2, 4, 6, 8, 12, 24 or 48 hours after the irradiation, as well as on the 18th day, for subsequent examination by electron microscopy and optical microscopy. Characteristic areas of necrosis have been detected by optical microscopy as soon as 2 hours after the irradiation and could be well defined up to 48 hours post irradiation. The examination by electron microscopy revealed these pathological changes to be due to shrinkage. The necrotic areas have been found at various places of the embryonic organisms, with the strongest evidences of necrosis having been found in the primordial extremeties and in the brain and spinal cord anlage. Taking into account these findings and the results obtained, the development of typical radiation-induced malformations can be explained in terms of embryology. Analogous to other teratogeneous substances known to induce necrosis already 2 hours after application, a radiation-induced effect on the cell cycle during the S-phase can be expected.

3068 **(INIS-mf—7019) Determination by R/A of plasma cortisol levels as a parameter of adrenocortical function before and after radiotherapy of gynaecological genital carcinoma.** Freischem, C.W. (Koeln Univ. (Germany, F.R.). Frauenklinik). (Koeln Univ. (Germany, F.R.). Medizinische Fakultaet). 19 May 1980. 96p. (In German). NTIS (US Sales Only), PC A05/MF A01. Order Number DE82780761.

Thesis.

In 20 female patients with carcinoma of the genitals, day profiles of cortisol were established and ACTH stimulation tests carried out directly after radiotherapy and 6 months later. Plasma concentrations of cortisol were determined in a RIA as parameters of the adrenocortical function. The assumption of a change in adrenocortical activity after radiotherapy of gynaecological genital carcinoma could not be validated. Instead, there was a typical diurnal rhythm of plasma cortisol, with a peak in the early morning hours and a decrease until midnight. The same applies to the ACTH stimulation tests: In all cases, plasma cortisol levels were elevated after intravenous application of ACTH. This means that the 1976 findings of Samundzham and Butsan could not be proved. Since adrenal functions were absolutely normal in the observed cases, the adynamic clinical picture of patients after radiotherapy, which is rather infrequent, cannot be explained as being due to an impaired adrenocortical function.

3069 **(INIS-mf—7020) Examination of the haemostatic system in radiation and combination hazards.** Boegelein, K. (Technische Univ. Muenchen (Germany, F.R.). Fakultaet fuer Medizin). 13 Mar 1980. 117p. (In German). NTIS (US Sales Only), PC A06/MF A01. Order Number DE82780760.

Thesis.

Female mice of the NMRI-lineage were exposed to irradiation and, additionally, to an open wound in the back skin. The coagulation and the fibrinolysis were examined, comparing them with those of animals who had either been irradiated or had an open back skin wound, and the thrombocytes were counted. Here, no pathological values of the plasmatic coagulation system were found. In the first days, only after combined radiation damage, an increased coagulation potential could be found. Also indications to a reduction of the fibrinolytic activity were found. At the same time, the circulating thrombocytes were increased in most cases. With the radiation-induced thrombocytopenia, the coagulation was reduced; the thrombo-elasticity was reduced, the coagulation time was elongated. The significance and duration of the coagulation disturbances varied with the radiation dose of the combination hazards. During the haemorrhagic phase, in the animals with combined hazards the fibrinolytic potential was increased. The possible causes and the peculiarities of the elongations in the coagulation and fibrinolysis system by combined radiation hazards and possible therapies are discussed.

3070 **(INIS-mf—7165) Effects of gamma radiation on the behaviour of the sugar cane borer Diatrea saccharalis (Fabr., 1794) (Lepidoptera: Pyralidae).** Contreras Duran, J.V. (Sao Paulo Univ., Piracicaba (Brazil). Escola Superior de Agricultura Luiz de Queiroz). Aug 1980. 72p. (In Portuguese). NTIS (US Sales Only), PC A04/MF A01. Order Number DE83780007.

Thesis.

Some effects of gamma radiation on the behaviour of Diatraea saccharalis (Fabr., 1794) (Lepidoptera:Pyralidae) were studied under controlled conditions of temperature (28 +- 2°C) and relative humidity (75 +- 10%). The insects were reared on an artificial diet and the adults were irradiated at 24 hour age, in each treatment, to observe the effects of the gamma radiation on the sugar cane borer, in order to provide data for future researches in the Sterile Insect Technique. Cobalt-60 was used as a source of radiation with a dose-rate of 353 krad/hour. Also an activi-meter and climatized room were used. The effects of radiation under cooling (5 +- 1°C) and normal conditions were determined concerning the insect activity, oviposition, competitiveness, mating and longevity. These data were obtained for both sexes and the conclusions were as follows: a) The sterilizing doses of gamma radiation do not affect the sexual behaviour of the insect, even under cooling conditions; b) the percentages of egg unviability are directly proportional to the dosis either for the females or the males; c) D. saccharalis is active only in the scotophase and therefore it can be characterized as a nocturnal insect.

3071 **(INIS-mf—7172) Ionizing radiation perception by insects.** Campanhola, C. (Sao Paulo Univ., Piracicaba (Brazil). Escola Superior de Agricultura Luiz de Queiroz). Apr 1980. 114p. (In Portuguese). NTIS (US Sales Only), PC A06/MF A01. Order Number DE83780005.

Thesis.

The proof of the existence of a perception for ionizing radiation by insects was aimed at, as well as the determination of its processing mechanism. It was tried also to check if such perception induces the insects to keep away from the radiation source, proving therefore a protection against the harms caused by ionizing radiation, or else the stimulus for such behaviour is similar to that caused by light radiations. ^{60}Co and ^{241}Am were used as gamma radiation sources, the ^{60}Co source of 0.435mCi and the ^{241}Am of 99.68mCi activity. Adult insects were used with the following treatments : exposure to ^{60}Co and ^{241}Am radiation and non-exposure (control). A total of approximately 50 insects per replication was released in the central region of an opaque white wooden barrier divided into 3 sections with the same area - 60.0 cm diameter and 7.5 cm height - covered with a nylon screen. 5 replications per treatment were made and the distribution of the insects was evaluated by photographs taken at 15, 30, 45, and 60 minutes after release. Sitophilus oryzae (l., 1763) and Ephestia cautella (Walker, 1864) showed some response to ^{241}Am gamma radiation, i.e. negative tactism. It was concluded that ionizing radiations can be detected by insects through direct visual stimulus or by visual stimulus resulting from interaction of radiation-Cerenkov radiation - with some other occular component with a refraction index greater than water. Also, the activity of the radioactive source with regard to perception for ionizing radiation, is of relevance in comparison with the energy of the radiation emitted by same, or in other words, what really matters is the radiation dose absorbed.

3072 **(KFK—3218) Analysis of the stochastic somatic fatalities evaluated in the German Nuclear Power Plant Risk Study.** Ehrhardt, J. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Neutronenphysik und Reaktortechnik; Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Projekt Nukleare Sicherheit). Oct 1981. 117p. (In German). Dep. NTIS (US Sales Only), MF A01. Order Number DE82750214.

The number of latent cancer fatalities estimated in the German Risk Study (Phase A) is analyzed with respect to the essential models. Special attention is given to the following topics: (1) Allocation of the number of fatalities to the population living

during the nuclear accident and to persons born afterwards. (2) Contributions of the relevant exposure pathways and types of cancer to the late fatalities. (3) Estimation of the number of fatalities expected within and beyond a distance of 540 km from the site (alteration of model assumptions). (4) Estimation of the relative portion of late fatalities caused by radiation doses below the dose limits of the German radiation protection regulations. Additionally, the influence of a non-linear dose response function similar to WASH 1400 on the latent cancer fatalities is estimated. The abovementioned results provide conclusions concerning necessary improvements of models in Phase B of the Risk Study.

3073 **(KFK—3265) Effects of low doses of different radiation qualities on Vicia faba bean root meristems.** Marshall, I. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Kernphysik; Karlsruhe Univ. (TH) (Germany, F.R.). Fakultaet fuer Physik). Jan 1982. 96p. Dep. NTIS (US Sales Only), MF A01. Order Number DE82750647.

Thesis.

The effects of low doses of different radiation qualities have been investigated using the micronuclei induction in Vicia faba bean roots as an indicator. The radiation qualities used were: ^{60}Co-gamma rays, high energy neutrons (maximum energy 600 MeV), low energy neutrons (mean energy 2.35 MeV), negative pions in the plateau region and negative pions in the stopping region. It was found that the best fit to the gamma ray data was obtained by using a linear+quadratic relationship, while in the case of the other radiation qualities a linear equation, represented the best fit, implying the non-existence of a threshold dose. No dose-rate, fractionation or oxygen effect was found for gamma radiation in the low dose region (below 20cGy) where the linear dependence between effect and dose is dominant. In contrast, in the high dose region these effects were present as normally expected. Fractionation experiments were carried out using high energy neutrons and pion radiation. No recovery was observed after neutron radiation while some recovery was found for the pion radiation. The RBE values found for the two neutron energies were in the high dose region 4.7 +- 0.4 and 11.8 +- 1.3. In the low dose region the RBE value approached a constant value of 25.4 +- 4.4 for the high energy neutrons and 63.7 +- 12.0 for the low energy neutrons.

3074 **(ORNL/TM—8428) Nuclear medicine. Progress report for quarter ending June 30, 1982.** Knapp, F.F. Jr.; Ambrose, K.R.; Butler, T.A.; Goodman, M.M.; Hoeschele, J.D.; Srivastava, P.C. (Oak Ridge National Lab., TN (USA)). Sep 1982. Contract W-7405-ENG-26. 22p. NTIS, PC A02/MF A01. Order Number DE83000424.

The oxidation products of tellurium and selenium fatty acids were shown to differ and may relate to the unique prolonged retention of tellurium fatty acids in the heart. The studies suggest that the trapping of tellurium fatty acids in the heart may result from the formation of an insoluble oxidation product after entry into the cells of the heart muscle. Also described in this report is the synthesis of several barbituric acid analogues for evaluation as potential cerebral perfusion agents. The present studies indicate that the iodovinyl-alkyl barbiturates cross the intact blood-brain barrier but undergo in vivo deiodination as measured by a high uptake of radioiodine in the thyroid. During this period four ^{191}Os-osmate shipments were made to Medical Cooperative investigators for evaluation of the ultrashort-lived ^{191}/sup m/Ir (T/sub 1/2/ = 4.9 sec) obtained from the ^{191}/sup m/Ir generator. Seven shipments of the ^{195}/sup m/Pt-labeled cis-dichlorodiammineplatinum(II) antitumor drug were made to collaborators and fice shipments of radiolabeled tellurium fatty acids were made to the Massachusetts General Hospital.

3075 **(PB—82-199787) Directory of personnel responsible for radiological health programs.** (Bureau of Radiological Health, Rockville, MD (USA)). Oct 1981. 45p. NTIS, PC A03/MF A01.

This is a directory of professional personnel who administer the radiological health program activities in State and local government agencies. Included in the Directory is a listing of each State health officer or the head of the agency responsible for the radiological health program. The name, address, and telephone number of the radiological health program is listed, followed by the alternate contact who, in many instances, may be chief of a larger administrative unit of which the radiological health program is a subunit. The address for the program is also included if it differs from the official health department or agency. Generally, the titles of the personnel listed will indicate the administrative status of the radiological health program. The Directory also includes a list of the key names, addresses, and phone numbers of selected key personnel in those Federal agencies listed in the Contents.

3076 **(RERF-TR—8-79) Radiological features of spondylolysis and spondylolisthesis in the adult health study sample.** Kawanami, T.; Tamura, S.; Russell, W.J. (Radiation Effects Research Foundation, Hiroshima (Japan)). Feb 1981. 22p. (In Japanese, English). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702551.

Radiographs made periodically of the lumbosacral spines of 85 spondylolysis and 31 spondylolisthesis patients were studied for interval changes during observation periods as long as 20 years. Five had spondylolysis at multiple levels and four had spondylolysis and spondylolisthesis at different levels; 31% of the spondylolysis was unilateral whereas the previously reported rate was 20%. Four types of isthmic defects occurred. A broad-angular type was observed only at the upper lumbar levels, and this probably develops in a manner different from the other types. Of 40 persons with unilateral defects 25 had elongation of their contralateral intact isthmus, most likely due to repeated fractures and healing, with increase in its length each time. One case of spondylolisthesis developed to double level involvement. A trapezoidal shaped vertebral body, hypermobility of the affected vertebral body, and progressive degenerative disc changes predisposed to anterior displacement, but when intervertebral spaces became markedly narrowed, the anterior displacement ceased. Contrary to earlier reports, this study shows that spondylolysis can develop and progress to spondylolisthesis in middle aged and older persons.

3077 **(SSI-A—81-22) Cesium-137 of the control group of SSI 1979 and 1980.** Eklund, G.; Falk, R. (Statens Straalskyddsinstitut, Stockholm (Sweden)). Oct 1981. 4p. (In Swedish). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702552.

The whole-body counter of the Institute has been used to measure the content of cesium-137 of a control group. The arithmetical average for 1979 was 52 Bq and 44 Bq for the year 1980.

3078 (UTNL-R—0084, pp 130-135) **Calculation of absorption energy in cell nucleus and survival curve.** Kobayashi, T.; Kanda, K. (Kyoto Univ., Kumatori, Osaka (Japan). Research Reactor Inst.). 1980. (In Japanese). Dep. NTIS (US Sales Only).

From Neutronics study meeting on development of new detectors and NE213 scintillator and on medical irradiation in reactors; Tokai, Japan (20 Dec 1979).

Absorption energy by thermal neutron capture of ^{10}B in cell nucleus was analyzed applying a sphere model of the cell. Radius and mutual distance of cell nucleus, and range, energy loss, and generation pattern of the particles were taken as parameters to evaluate the local effects quantitavely. Combination of one-hit theory and Poisson's distribution theory fitted well to the actual survival curve of cells, obtained from colony method. Absorption energy pattern in cell nucleus necessary for one-hit indicated the ^{10}B distribution, which was responsible for survival ratio.

3079 **Hyperoxia, but not thoracic X-irradiation, potentiates bleomycin- and cyclophosphamide-induced lung damage in mice.** Hakkinen, P.J.; Whiteley, J.W.; Witschi, H.R. (University of Tennessee-Oak Ridge Graduate School of Biomedical Sciences). *American Review of Respiratory Diseases;* **126**: No. 2, 281-285(Aug 1982).

The intraperitoneal administration of cyclophosphamide or bleomycin to BALB/c mice resulted in lung cell damage followed by cellular proliferation, which was quantitated by measuring the increase in thymidine incorporation into pulmonary DNA. We have previously shown that administration of the antioxidant butylated hydroxytoluene produces lung damage that can be potentiated by both hyperoxia and thoracic X-irradiation. In the present study we

show that hyperoxic exposure also potentiates bleomycin- and cyclophosphamide-induced acute lung damage. However, thoracic X-irradiation does not potentiate bleomycin- and cyclophosphamide-induced lung toxicity.

3080 **Malignant melanoma incidence at the Los Alamos National Laboratory.** Acquavella, J.F.; Tietjen, G.L.; Wilkinson, G.S.; Key, C.R.; Voelz, G.L. (Los Alamos National Lab., NM (USA)). *Lancet;* **1**: No. 8277, 883-884(17 Apr 1982).

In an analysis of melanoma incidence for 1969 to 1978 among 11 308 workers at the Los Alomas National Laboratory in New Mexico 6 cases were detected in the total cohort, in which 5.69 cases would be expected (standardised incidence ratio [SIR] = 105; 90% confidence interval [CI] = 51,198) on the basis of incidence rates for the State of New Mexico, specific for age, sex, and ethnic origin. Among the White non-Hispanic men, 3 cases were detected, whereas 4.4 would be expected. The associate SIR of 68 (90% CI = 23, 163) does not suggest excess melanoma incidence in this subcohort. A direct comparison with Statewide incidence rates gave similar results. These results do not agree with the threefold excess of malignant melanoma incidence found among White male employees at the Lawrence Livermore National Laboratory.

3081 **Plate assay for chemical- and radiation-induced mutagenesis of CAN1 in yeast as a function of post-treatment DNA replication: The effect of rad6-1.** Lemontt, J.F.; Lair, S.V. (Oak Ridge National Lab., TN (USA). Biology Div.). *Mutation Research;* **93**: No. 2, 339-352(Apr 1982).

An agar post-treatment method was used to monitor levels of ultraviolet light- and hydrazine-induced mutagenesis at CAN1 in Saccharomyces cerevisiae as a function of post-treatment cell division prior to selection for canavanine-resistant mutants with a top-agar overlay containing canavanine. The advantage of this method is that it permits reliable measurements of mutation induction during the early period before, during, and after the first round of post-treatment DNA replication. In strains that are wild-type for DNA repair, ultraviolet light mutagenesis appears to be a pre-replicative phenomenon, while mutation by hydrazine involves a replicative or post-replicative mechanism. Most chemical mutagenesis in yeast requires a functional RAD6 gene. Hydrazine mutability is also reduced by rad6-1, suggesting a possible misrepair mechanism.

3082 **Radiosensitivity and life span of dog peripheral blood lymphocytes.** Leonard, A.; Decat, G. (Centre d'Etude de l'Energie Nucleaire, Mol (Belgium). Dept. de Radiobiologie); Fritz, T.E. (Argonne National Lab., IL (USA). Biological and Medical Research Div.). *Mutation Research;* **92**: 257-263(1982).

Observations made after 48 h of cultivation show that 52% of dog lymphocytes are already in M_2 and 17% in M_3 at that fixation time. Evidently, the large discrepancy observed between man and dog with respect to the yield of dicentric chromosomes induced by an exposure to 200 rad of X-rays and observed after a culture time of 48 h does not correspond to a difference in chromosomal radiosensitivity. There is, indeed no statistically significant difference between the yield of dicentrics observed in M_1 human lymphocytes (32.0 per 100 cells) and that in dog lymphocytes after correction of the values obtained at 48 h (28.6 per 100 cells.) From the observations performed on whole-body irradiated dogs one can estimate that the half-time of dog lymphocytes carrying chromosome aberrations is less than 30 days.

3083 **DNA content of cells with generalized chromosome shattering induced by ultraviolet light plus caffeine.** Cremer, C.; Gray, J.W. (California Univ., Livermore (USA). Lawrence Livermore National Lab.). *Mutation Research;* **94**: 133-142(1982).

Asynchronously growing Chinese hamster cells (M3-1) were UV-irradiated (lambda = 254 nm) and then incubated with/without caffeine (2 mM) for 20 h. Microscopic evaluation of metaphase spreads revealed that after UV-irradiation alone (5.0 J/m^2) and caffeine treatment alone, the percentage of cells with condensed chromatin appearing fragmented and/or pulverized ('GCS-like' cells; GCS, Generalized Chromosome Shattering) was very low while it was high following the combined treatment. Cytogenetic and flow cytometric analysis of cells obtained by mechanical shaking cultures treated with UV and caffeine indicated that 'GCS-like' cells have the same DNA content as untreated cells in G2 phase and mitosis.

3084 **Do childhood cancers result from prenatal X-rays.** Totter, J.R.; MacPherson, H.G. (Oak Ridge National Lab., TN (USA)). *Health Physics;* **40**: No. 4, 511-524(Apr 1981).

An independent review of the Oxford Survey of Childhood Malignancies is presented. It is shown that 1) the association of x-rays with cancer deaths decreased over the years, 2) the claimed residual effect of x-rays is in conflict with the direct evidence from Hiroshima and Nagasaki, 3) the interpretation of the data involved an unjustified assumption of a uniformity between cancer patient subpopulation and the population of controls and 4) the dose-response curves used lack validity. A reasonable explanation not involving radiogenic cancer for the excess incidence of X-ray examinations among pregnant women whose offspring were destined to die of cancer in childhood is proposed.

3085 **Interaction of 8-methoxypsoralen and near-UV light causes mutation and cytotoxicity in mammalian cells.** Schenley, R.L.; Hsie, A.W. (Oak Ridge National Lab., TN (USA)). *Photochemistry and Photobiology;* **33**: No. 2, 179-185(Feb 1981).

The interaction of near-UV light and a photosensitizer, 8-methoxypsoralen (8-MOP), was studied in the Chinese hamster ovary cell/hypoxanthine-guanine phosphoribosyl transferase system; cell survival (cloning efficiency) and mutation induction (resistance to 6-thioguanine) were quantified. Exposure of cells to either 8-MOP up to 20 μg/ml (93 μM) or near-UV light up to 40 000 J/m^2 had no effect on either survival or mutation frequency. Preincubation of cells with 8-MOP from 5 to 120 min prior to irradiation with various fluences did not affect cell survival or mutation frequency. Survival decreased and mutation frequency increased linearly when either the 8-MOP concentration or fluence was increased while the other factor was held as a constant. Mutation frequency appears to show reciprocity relative to the product of 8-MOP concentration times fluence of near-UV light [(μg/ml).(J/m^2)] throughout a range apparently limited by high cell lethality. The observed pooled data on mutation, f(x), as a function of (μg/ml).(J/m^2), x, fit a linear dose-response line, f(x) = (34.2 + 0.05 x) x 10^{-6}. Cell survival, however, does not appear to exhibit such reciprocity.

3086 **(PB—82-198813) Council directive of 15 July 1980 amending the directives laying down the basic safety standards for the health protection of the general public and workers against the dangers of ionizing radiation (Official Journal of the European Communities l 246 of 17.9.1980).** (Commission of the European Communities, Luxembourg). [nd]. 81p. NTIS, PC A05/MF A01.

As provided for in the Euratom Treaty, and in particular Article 30 thereof, basic standards for the protection of the health of workers and the general public against the dangers arising from ionizing radiations must be established to enable each Member State in accordance with Article 33 of the Euratom Treaty to lay down provisions by legislation, regulation or administrative action to ensure compliance with such standards, to take the necessary measures with regard to teaching, education and vocational training and to make these provisions in harmony with the provisions applicable in this field in the other Member States. On 2. February 1959, the Council adopted a Directive establishing basic safety standards. These were modified partially by the Directives of 5. March 1962, 27. October 1966 and 1. June 1976. The present edition reproduces the complete text of the Directive amending the Directives laying down the basic safety standards for the health protection of the general public and workers against the dangers of ionizing radiation, adopted by the Council on 15. July 1980. These new standards take into consideration increasing scientific knowledge in the field of radiological protection and radiobiology and the practical experience of applying these Directives in national laws.

5602 Thermal Effects

REFER ALSO TO CITATION(S) 2080, 2080

5603 Chemicals Metabolism And Toxicity

REFER ALSO TO CITATION(S) 1535, 1535, 1536, 1629, 1630, 2075, 2971, 2972, 3039, 3053, 3081

3087 **(CONF-821058—1) Acid deposition: effects on terrestrial ecosystems.** Shriner, D.S. (Oak Ridge National Lab., TN (USA)). 1982. Contract W-7405-ENG-26. 3p. NTIS, PC A02/MF A01. Order Number DE83001967.

From Estonian Academy of Sciences conference; Liningrad, USSR (9 Oct 1982).

The effects of acid rain on forest ecosystems and agricultural crops is briefly summarized and the degree to which these effects are presently understood discussed. (ACR)

3088 (DOE/EV/04733—5, pp 241-251) **Chemosensitization in vitro.** Roizin-Towle, L.; Hall, E.J. Jul 1982. NTIS, PC A14/MF A01.

In Radiation physics, biophysics and radiation biology. Progress report, October 1, 1981-November 30, 1982.

Previous studies with misonidazole have shown that it can sensitize cells to the cytotoxic action of various antineoplastic agents when used in a sequential manner. This paper addresses the mechanisms of the interaction resulting from various sensitizer-chemotherapy drug sequences in vitro. The data show that a variety of nitroimidazoles, in addition to misonidazole, sensitize cells to a subsequent treatment with melpholan. These sensitizers differ in the extent to which they enhance melphalan toxicity and there is a clear correlation between cell killing due to the sensitizer pretreatment and chemotherapy drug enhancement, suggesting a common mechanism for the various nitroimidazoles. (KRM)

3089 **(Juel—1717) Study of endogenic abscisic acids and cytokinin content in soybean crops of variable salt sensitivity as well as the effect of exogenically applied abscisic acid on Cl^- translocation.** Roeb, G. (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Inst. fuer Radioagronomie). May 1981. 106p. (In German). NTIS (US Sales Only), PC A06/MF A01. Order Number DE82903949.

Thesis. Submitted to Univ. of Bonn, Germany.

A study of the phytohormones abscisic acid and cytokinin with respect to plant salt stress and its relationship to genetic control over endogen content. An analysis is made of the acid cytokinin content, and an investigation is made of the influence exerted by exogenic applied synthetic abscisic acid on Cl^- uptake and accumulation. 275 references, 14 figures, 11 tables.

3090 **(PB—82-172172) Health hazard evaluation report no. HHE-80-185-842, Department of Municipal Railway, Woods Division, San Francisco, California.** Belanger, P.L. (National Inst. for Occupational Safety and Health, Cincinnati, OH (USA)). Mar 1981. 14p. (HHE—80-185-842). NTIS, PC A02/MF A01.

Environmental air samples were analyzed for sulfur-dioxide (7446095), formaldehyde (50000), nitrogen-dioxide (10102440), carbon-monoxide (630080), and total particulate matter emanating from diesel exhaust fumes at the Department of Municipal Railway, Wood Division, (SIC-4172), in San Francisco, California on July 23, and September 23, 1980. A representative of the Civil Service Association, Local 400, requested the evaluation on behalf of an unspecified number of workers. No sulfur-dioxide gas was detected. Carbon-monoxide concentrations ranged from below the limits of detection to 7 parts per million (ppm) compared with the California-OSHA standard of 50ppm. All total particulate samples were well below the California-OSHA standard of 10 milligrams per cubic meter. Informal medical interviews with 12 employees revealed complaints of headache, eye, nose, and throat or lung irritation. The author concludes that health hazards from sulfur-dioxide, formaldehyde, nitrogen-dioxide, carbon-monoxide, and total particulates do not exist, although symptoms reported are consistent with diesel fume exposure. They recommend medical surveillance, educational programs, and ventilation improvements.

3091 **(PB—82-174459) Health hazard evaluation and technical assistance composite report on lead studies for TA-76-105, Gould and Co., Kankakee, Illinois (supplement).** Thorburn, T.W.; Carnow, B.W.; Conibear, S.A. (National Inst. for Occupational Safety and Health, Cincinnati, OH (USA)). Jul 1978. 20p. (TA—76-105SUPPL). NTIS, PC A02/MF A01.

In January of 1975 OSHA inspected this plant and cited them for violations of the air-borne lead standard. At OSHA's request, NIOSH arranged for a medical evaluation of the worker's current health status. The medical examinations were performed during October 1976 on workers in this lead battery plant which was still under abatement. There were 278 workers screened using a ZPP test, followed by the examination of 109 with a history, physical examination and laboratory tests. The more extensive study involved those who worked at high risk jobs or had a ZPP value equal to or greater than 90 micrograms percent. Three-fourths of all the workers tested had blood lead levels equal to or greater than 40 micrograms per 100 ml of blood, 9% being over 60 micrograms/100 ml but not over 70 micrograms/100 ml. One-third had abnormally elevated ZPPs. Almost half apparently had abnormally elevated blood pressure and a significant number had abnormalities of the urine and other parameters of renal function including creatinine and BUN. Further, 10 percent were found to have abnormally low hematocrits and hemoglobins.

3092 **(PB—82-182452) Rare, threatened, and endangered plant species southwest Florida and potential OCS activity impacts.** McCoy, E.D. (University of South Florida, Tampa (USA)). Nov 1981. 97p. NTIS, PC A05/MF A01.

This report on rare, threatened, and endangered plants of southwest Florida is a compilation of all species so designated or considered for listing by Federal, State, and private agencies or organizations. Of 274 species in Pinellas, Hillsborough, Manatee, Sarasota, Charlotte, Lee, Collier, and Monroe Counties, 43 occurring in coastal habitats will be most affected by Outer Continental Shelf development.

3093 **(PB—82-186792) Health assessment document for polycyclic organic matter. Final report.** Santodonato, J.; Howard, P.; Basu, D.; Lande, S.; Selkirk, J.K. (Syracuse Univ. Research Corp., NY (USA)). Feb 1979. 492p. NTIS, PC A21/MF A01.

The document responds to Section 122 of the Clean Air Act as Amended August 1977, which requires the Administrator to decide whether atmospheric emissions of polycyclic organic matter (POM) potentially endanger public health. This document reviews POM data on chemical and physical properties, atmospheric forms, atmospheric fate and transport, measurement techniques, ambient levels, toxicology, occupational health, and epidemiology. Polycyclic aromatic hydrocarbons (PAH's), such as the carcinogen benzo(a)pyrene (BaP), and their neutral nitrogen analogs are the two POM chemical groups occurring most frequently in ambient air. The major environmental sources of POM's appear to be the combustion or pyrolysis of materials containing carbon and hydrogen. There is general agreement that POM compounds are associated with suspended particulate matter from both mobile and stationary sources, principally respirable particles. Available monitoring data suggest that many POM compounds associated with particulate matter probably are stable in ambient air for several days. The major health concern over exposure to POM's is their carcinogenicity. POM's gain ready access to the body's circulation either by inhalation, ingestion, or skin contact. Although it cannot be stated unequivocally that any POM's are human carcinogens, several of these compounds are among the more potent animal carcinogens known.

3094 **(PB—82-189572) A screening procedure for the impacts of air pollution sources on plants, soils, and animals. Final report.** Smith, A.E.; Levenson, J.B. (Argonne National Lab., IL (USA)). Dec 1980. 119p. NTIS, PC A06/MF A01.

Section 165 of the Clean Air Act requires preconstruction review of major emitting facilities to provide for the prevention of significant deterioration (PSD) and charges Federal Land Managers (FLMs) with an affirmative responsibility to protect the air quality-

related values of Class I areas. Regulations implementing these provisions require an analysis of the impairment to visibility, soils, and vegetation (52.21(o)). The information and screening procedure presented here provide interim guidance: (1) to aid in determining whether emissions are significant or whether there are significant air quality impacts under Section 52.21(o), and (2) to aid in flagging sources which should be brought to the attention of an FLM under Section 52.21(p). Impacts on vegetation and soils are the principal areas addressed by the procedure which thus takes a limited view of the possibly broad scope of air quality-related values. A selected review of impacts on fauna has also been included and the odor potential of regulated pollutants is addressed. This procedure is intended for use by air quality engineers and is not a manual for the assessment of impacts on plants, soils, and other air quality-related values such as would be suitable for an ecologist.

3095 **(PB—82-194127) Infectivity model verification studies, annual report - 1981.** McGrath, J.J. (Texas Tech Univ., Lubbock (USA). Dept. of Physiology). Jan 1982. 71p. NTIS, PC A04/MF A01.

The infectivity model has been used as one of the leading indicators of the potential health effects that may be associated with energy-related pollutants including nitrogen dioxide (NOs), ozone, and diesel exhaust. The original studies with the infectivity model and chronic exposure to NO2 reported by Ehrlich and Henry (1968) have not been replicated. This report details the work that has been performed in Texas Tech's laboratory thus far in initiating a chronic NO2 exposure study to replicate the original work by Ehrlich and Henry, and reviews the preliminary results. At the end of the first contract year, a functioning inhalation facility with a capability to expose animals continuously to low levels of NO2 is in place. One group of animals has been exposed to NO2 for eight months and challenged with Klebsiella pneumonia by inhalation. The results are similar to, but do not replicate entirely, those reported by Ehrlich and Henry. Two additional exposures have been initiated, and the animals will be challenged with the infectious agent in a bacterial infectivity chamber similar to that used by EPA.

3096 **(PB—82-195538) Air pollution effects on yield, quality and ecology of range and forage grasses. Final report 18 May 79-28 Feb 81.** Youngner, V.B.; Shropshire, F.M.; Taylor, O.C.; Flagler, R.B. (California Univ., Riverside (USA)). Dec 1981. 136p. NTIS, PC A07/MF A01.

In order to determine the effects of chronic exposure to ozone and sulfur dioxide on yield and forage quality, seven forage and seven range grasses were exposed to various levels of the pollutants in closed fumigation chambers. Ozone levels were 100, 67, 33, and 0 percent of ambient. Sulfur dioxide was supplied at 10 ppm. Yield parameters studied were total forage dry weight, tiller production and dry weight per tiller. The quality parameters were forage content of nonstructural carbohydrates, crude protein, crude fiber, calcium, magnesium and phosphorus. Chronic ozone exposure affected yield in varying degrees in all of the forage grasses. Effects were also observed on all quality parameters but species differed in their responses. The most pronounced response was in soluble carbohydrate levels. Because species differed in their growth responses to the pollutants, possible changes in species composition of natural grasslands subjected to air pollution must be considered.

3097 **(PB—82-195959) Hazard evaluation and technical assistance report no. TA-77-18, KW Battery Division, Skokie, Illinois.** Belanger, P.L.; Thoburn, T.W. (National Inst. for Occupational Safety and Health, Cincinnati, OH (USA)). Nov 1978. 43p. NTIS, PC A03/MF A01.

The National Institute for Occupational Safety and Health (NIOSH) conducted an environmental/medical survey to determine employees' exposures to inorganic lead at KW Battery Division, Skokie, IL. The survey was accomplished on May 17-19, June 2-3, and August 11-12, 1977. Based on medical results it appears that the bag house rupture occurring sometime in the fall of 1976 led to excessive lead exposure with a number of workers being seen and treated at Cook County Hospital. Review of company lead monitoring data suggests that the majority of workers treated possibly had blood lead values over 60 microgram/100 ml at the time they were seen. Almost none of the workers seen at Cook County were available at the time of the NIOSH study.

3098 **(PB—82-195967) Health hazard evaluation determination report no. HE-77-28-552, delco Battery Plant, Muncie, Indiana.** (National Inst. for Occupational Safety and Health, Cincinnati, OH (USA)). Dec 1978. 80p. NTIS, PC A05/MF A01.

A survey team from the National Institute for Occupational Safety and Health (NIOSH) performed a health hazard evaluation at Delco Battery Plant, Muncie, IN., on February 16-17, March 21-23, April 4-6, and August 25-27, 1977. The following determinations are based upon environmental measurements of airborne lead concentrations medical screening, testing and evaluation, a review of pertinent literature, review of the company's lead monitoring-data, observations of employees' work practices and engineering controls.

3099 **(UCID—19584) Model assessment of ozone-caused soybean losses for Illinois and Indiana.** King, D.; Kercher, J.; Bingham, G. (Lawrence Livermore National Lab., CA (USA)). Oct 1982. Contract W-7405-ENG-48. 22p. NTIS, PC A02/MF A01. Order Number DE83001843.

Crop fumigation experiments suggest that anthropogenically-generated ozone causes significant yield reductions across much of the US. Several loss estimates have been completed based on dose-response curves derived by regressions to data from open-topped field chamber experiments. However, it is difficult to judge the accuracy of these estimates because of possible differences between chambers and the nation at large in (a) ozone concentration time sequences, (b) ozone spatial concentration gradients, (c) weather and (d) soil water content. This report describes a preliminary assessment which demonstrates the feasibility of using a crop simulation model to estimate regional crop losses due to air pollutants.

3100 **Genotoxic effects of sunlight-activated waste water in cultured mammalian cells.** Strniste, G.F.; Chen, D.J.; Okinaka, R.T. (Los Alamos National Laboratory, NM). *JNCI, Journal of the National Cancer Institute;* **69**: No. 1, 199-203(Jul 1982).

Cultured Chinese hamster ovary cells were incubated with dilutions of an oil shale retort process water and exposed to nautral sunlight. An enhancement of sevenfold to ninefold was seen in photoinduced cytotoxicity (by a colony-forming assay) and mutagenicity [at the hypoxanthine phosphoribosyltransferase (HPRT) locus] for cells pretreated with the process water compared to effects seen in cells exposed to sunlight only. Significant photoinduced cytotoxicity was also observed in cultured human skin fibroblasts when exposed to the process water before being exposed to near UV (NUV) radiation. The mutation frequencies (determined for the HPRT locus) induced by the process water and NUV radiation were as great as those frequencies seen for far UV light alone. Increases in genotoxicity were observed in excision repair-deficient xeroderma pigmentosum skin fibroblasts when compared to the responses seen in normal cells. Risks to health resulting from the phototransformation of these oil shale retort process waste waters are unassessed at this time.

3101 **Mortality and air pollution - lessons from statistics.** Lipfert, F.W. (Brookhaven National laboratory, Upton, NY). *Science of the Total Environment;* **23**: 175-188(Apr 1982).

This paper reviews cross sectional studies which attempt to link persistent geographic differences in mortality rates with air pollution. Some early studies are mentioned and detailed results are given from seven major contemporary studies, two of which are still in the publication process. Differences among the studies are discussed with regard to statistical techniques, trends in the results over time (1959-1974), and interpretation and use of the results. The analysis concludes that there are far too many problems with this technique to allow causality to be firmly established, and thus the results should not be used for cost benefit or policy analysis.

5604 Other Environmental Pollutant Effects

REFER ALSO TO CITATION(S) 2922, 3057

3102 **(AD-A—111898/3) The biological effects of nonionizing radiation. Conference report.** Bateman, J.B. (Office of Naval Research (USA). London Branch Office). 29 Dec 1981. 23p. (ONRL-C—12-81). NTIS, PC A02/MF A01.

This is a critical report on the L.H. Grey Memorial Conference held in Oxford, 13-16 July 1981. The Conference was entitled 'Biological Action of Radiofrequency, Microwave and Ultrasonic Radiations.' The report provides a background identifying the field of interest in broader terms, intended for the general reader. It is then pointed out that the conference was mainly directed toward research and practice related to the possible value of nonionizing radiations in cancer therapy. There were, however, tutorial lectures of a fairly general character and some discussion of biological effects not necessarily arising from production of heat in irradiated tissues.

3103 **(AD-A—117527/2) Mechanism of electromagnetic energy effects of the nervous system. experimental system and preliminary results. Preliminary report Oct 79-16 Jun 81.** Campbell, N.L.; Brandt, C.L. (Naval Ocean Systems Center, San Diego, CA (USA)). 1 Jul 1982. 68p. NTIS, PC A04/MF A01.

Effects of high-level electromagnetic (EM) energy on living nerve tissue were assessed by subjecting individual nerve cells of the marine gastropod Aplysia californica to microwave radiation levels of 10-300 mW/sq cm . Of the 84 cells exposed, five showed inhibitory responses and one showed excitatory response that required from 6 to 82 minutes to develop. In each case, the cell returned to normal activity within 70 minutes of removing the EM field. It appears from the data collected that interaction of EM energy with the electrical activity of nerve cells does exist, and that this interaction is not heat-related. Understanding the mechanism of this interaction will provide a valuable tool in determining the hazards of nonionizing EM energy and the necessary safety limits of exposure.

57 HEALTH AND SAFETY

REFER ALSO TO CITATION(S) 1665, 1790, 2306, 2422, 3033

3104 **(SAND—82-2194) Special Projects Division. Quarterly report of progress, 1 July-30 September 1982.** (Sandia National Labs., Albuquerque, NM (USA); Tech. Reps., Inc., Albuquerque, NM (USA)). Oct 1982. Contract AC04-76DP00789. 20p. NTIS, PC A02/MF A01. Order Number DE83002157.

All 15 of the guidance documents on implementing Environment, Safety, and Health (ES & H) Assurance Programs have been completed. In addition, 13 of the 15 documents have been incorporated into a 2-volume compilation that is expected to simplify use of the guidance. The essential elements of the Pilot Project at Sandia National Laboratories have also been completed. This project was established to test the feasibility and cost-effectiveness of the approach to managing ES & H programs that is defined in the ES & H Assurance Program Standard. Results obtained in this test indicate that costs may be even lower than previously estimated (and equal to or lower than costs for traditional programs) and that the benefits obtained can be appreciable - including improved efficiency, greater employee awareness and interest, and a high probability of better performance.

3105 **(UCRL—88242) Prevention of back injuries and pain.** Baptiste, B. (Lawrence Livermore National Lab., CA (USA)). 11 Oct 1982. Contract W-7405-ENG-48. 6p. (CONF-821071—1). NTIS, PC A02/MF A01. Order Number DE83001176.

From 70. annual national safety congress and exposition; Chicago, IL, USA (19 Oct 1982).

Lawrence Livermore National Laboratory (LLNL), in conjunction with Hansen and Associates (San Mateo, CA), developed an employee education and training class in back care. In three years about 1500 LLNL employees have attended this class. According to accident statistics and employee questionnaires, the class has been effective in reducing back injury and pain.

58 GEOSCIENCES

5801 Geology And Hydrology

REFER ALSO TO CITATION(S) 1736, 1756, 1757, 1762, 1765, 2240, 2346, 2350

3106 **(DOE/ET/46617—T2) Geology and geohydrology of the East Texas Basin. A report on the progress of nuclear waste isolation feasibility studies (1980).** Kreitler, C.W.; Collins, E.W.; Davidson, E.D. Jr. (Texas Univ., Austin (USA). Bureau of Economic Geology). 1981. Contract AC97-80ET46617. 219p. NTIS, PC A10/MF A01. Order Number DE82021274.

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The third year of research was highlighted by the integration of regional basinal studies with growth histories for specific domes, studies of cap-rock diagenesis and salt deformation, preliminary studies of ground-water flow and geochemistry around Oakwood Dome, and preliminary studies of microseismicity in the Mount Enterprise fault zone. 119 figures, 15 tables.

3107 **(ONWI—277) Petrographic and geochemical characteristics of the Richton salt core.** Drumheller, J.C.; Fuerst, S.I.; Cavan, B.P.; Saunders, J.A. (Law Engineering Testing Co., Marietta, GA (USA)). Aug 1982. Contract AC06-76RL01830. 96p. NTIS, PC A05/MF A01. Order Number DE83000729.

Portions of document are illegible.

Law Engineering Testing Company supervised the drilling of a corehole into Richton dome, located in Perry County, Mississippi. A total of 188 feet of caprock and 501 feet of salt were recovered for physical examination and chemical analysis. This report describes the types of analyses performed and summarizes the data obtained. Geochemical analyses were performed including methane and CO_2. The caprock core is predominantly anhydrite, except for the top 23 feet, which is calcite. Numerous gypsum veins and zones (one of which is 11 feet thick) occur throughout the caprock. The salt core consists predominantly (> 90%) of crystalline halite which ranges from fine grained crystals (< .025 inch) to zones of megacrystalline halite over 3 feet long. Anhydrite observed in the salt core ranges from disseminated crystals less than 0.1 inch in length, to discrete clasts up to six inches in length (generally less than 1 inch wide).

3108 **(TVA/OECD/FPM—82/4) Floods on Valley River, Tatham Creek, and Junaluska Creek in the vicinity of Andrews, North Carolina. Flood report.** (Tennessee Valley Authority, Knoxville (USA)). Aug 1982. 71p. NTIS, PC A04/MF A01. Order Number DE82906081.

Portions of document are illegible.

This floodplain information study provides flood information for the Valley River and Tatham and Junaluska Creeks in the vicinity of Andrews, North Carolina. The study was requested by the town of Andrews to provide information reflecting current flood conditions in order for the town to better administer its floodplain management program. This investigation covers the Valley River from mile 15.32 to the mouth of Junaluska Creek at mile 20.55, Tatham Creek from the mouth upstream to the old US Highway 19-129 bridge at mile 0.48, and Junaluska Creek from the mouth upstream to the old US Highway 19-129 bridge at mile 0.92.

3109 **Al-26 content of Antarctic meteorites - Implications for terrestrial ages and bombardment history.** Evans, J.C.; Rancitelli, L.A.; Reeves, J.H. (Battelle Pacific Northwest Laboratories, Richland, WA). pp 1061-1072 of Lunar and planetary science conference. Vol. 1. New York, NY; Pergamon Press, Inc. (1979).

From 10. lunar and planetary science conference; Houston, TX, USA (19 Mar 1979).

5802 Geophysics

REFER ALSO TO CITATION(S) 1776, 1777, 2927, 2938, 2939, 2940

3110 **(BMFT-FB-T—82-062) Development of a method for routine registration of shear waves.** Janle, H.; Behle, A.; Sattlegger, J. (Bundesministerium fuer Forschung und Technologie, Bonn (Germany, F.R.)). Apr 1982. 90p. (In German). Dep. NTIS (US Sales Only), MF A01. Order Number DE82750654.

The results of these investigations are key findings for routine recording of S-waves and especially of converted waves (PS-waves). The application of PS-waves is recommended because of the possibility to record these waves parallel with routine seismic data gathering. The identification of PS-waves is achieved first through their direction of oscillation (polarization), secondly through analysis of their velocities in common offset plane sections. More sophisticated and automated methods of P-wave/PS-wave correlation are being developed. For further studies of S-events and for the interpolation of measurements with three-component-geophones, synthetic seismograms of two-dimensional models have been used. The seismograms have been calculated by the reflectivity method as well as by ray tracing. Furthermore, first efforts have been made to integrate results of this project with methods developed by the BMFT-project ET 3018 A (Inverse Modeling and Interface Analysis Sytem).

3111 **(NP—2905802) Scientific goals of laser range measurements.** Bender, P.L. (Joint Inst. for Lab. Astrophysics, Boulder, CO (USA); National Bureau of Standards, Boulder, CO (USA); Colorado Univ., Boulder (USA)). 1981. 10p. NTIS, PC A02/MF A01. Order Number DE82905802.

Two of the most important areas of geodynamics to which laser ranging appears capable of making fundamental contributions are discussed. These are worldwide plate tectonic motion measurements and the monitoring of the longer wavelength crustal movements in seismic zones. In both areas, the accuracy and reliability of the results are of great importance, since a factor 2 improvement in accuracy can reduce the time necessary for detecting anomalous motions by the same factor. The capabilities of other techniques are discussed briefly, and it is argued that laser ranging to satellites is likely to make major and unique contributions to geodynamics if it succeeds in demonstrating higher measurement accuracy than radio techniques. A strong emphasis on improving the measurement accuracy thus appears to be needed during the next two years.

5803 Mineralogy, Petrology, And Rock Mechanics

REFER ALSO TO CITATION(S) 1759, 1770, 2347, 2349, 2391

3112 **(ONWI—260) Heated flatjack test series to measure the thermomechanical and transport properties of in situ rock masses (heated block test).** Hardin, E.; Barton, N.; Lingle, D.; Board, M.; Voegele, M. (Terra Tek, Inc., Salt Lake City, UT (USA)). Sep 1982. Contract AC06-76RL01830. 195p. NTIS, PC A09/MF A01. Order Number DE83000728.

Portions of document are illegible.

An instrumented 8 m^3 block of jointed gneiss was subjected to biaxial and uniaxial loading at ambient and elevated temperatures, using flatjacks and a line of borehole heaters. The following rock mass properties were investigated under various conditions of stress (0 to 6.9 MPa, uniaxial and biaxial) and temperature (12 to 74°C mean block temperature): joint permeability, static modulus, dynamic modulus, joint normal and shear stiffness, coefficient of thermal expansion, thermal conductivity and diffusivity. The instrumentation array included multiple position borehole extensometers, DCDT and IRAD surface strainmeters, various borehole stressmeters and deformation gages, numerous thermocouples and Whittemore strain gage measurement points. The coefficient of thermal expansion was found to initially reduce with increasing temperature in the horizontal loaded directions, and to increase in the unloaded vertical direction. Static moduli varied with gage length and with the location of each instrument relative to jointing, yielding a distribution of moduli and Poisson's ratios. Joint permeability reduced by a factor of four under ambient loading (0 to 6.9 MPa), and by a factor of thirty when coupled with a 60°C rise in rock temperature, at unchanged stress.

3113 **(ONWI—308) Modelling rock joint behavior from in situ block tests: implications for nuclear waste repository design.** Barton, N. (Terra Tek, Inc., Salt Lake City, UT (USA)). Sep 1982. Contract AC06-76RL01830. 101p. NTIS, PC A06/MF A01. Order Number DE83000733.

Portions of document are illegible.

Simple, inexpensive index tests suitable for application to jointed core or jointed blocks of rock are described. These provide quantitative data on joint roughness, joint wall strength and residual friction angle, suitable for waste repository characterization. These three parameters form the basis of a new constitutive law of rock joint behavior which will enable numerical modellers to simulate the complete shear strength-displacement, dilation and closure of joints, including shear reversal and unloading cycles. Size effects are reviewed in detail and methods are developed for correcting the results of small scale tests to allow for limited sample size. The effects of shear displacement and dilation, normal closure and joint opening on permeability are modelled, so that fully coupled hydro-mechanical modelling can be achieved. The effects of extremely slow stress perturbations, periods of stick, and thermal loading on joint properties are also evaluated. The numerical modelling techniques are illustrated with numerous examples, and are validated against a large body of experimental data.

3114 **New models for rock joints and interfaces.** Heuze, F.E.; Barbour, T.G. (Lawrence Livermore Lab, CA, USA). *Journal of the Geotechnical Engineering Division, American Society of Civil Engineers;* **180**: No. GT5, 757-776(May 1982).

Two new developments and refinements in the modeling of rock structures are presented: a new model for axisymmetric interfaces, such as found in footing designs, and a new model which describes the dilatant effects of rock joints, such as encountered in underground caverns and reinforced rock slopes. The two new models were incorporated into a finite element program and test-case analyses were performed. The results indicate that the use of the new models can lead to more accurate estimates of footing settlement, to more economical designs of rock reinforcement, and to safer analysis of rock structures.

5804 Geochemistry

REFER ALSO TO CITATION(S) 1680

3115 **Sorption of uranium and cesium by Hanford basalts and associated secondary smectite.** Ames, L.L.; McGarrah, J.E.; Walker, B.A. (Pacific Northwest Lab., Richland, WA (USA)); Salter, P.F. (Rockwell International Corp., Richland, WA (USA). Rockwell Hanford Operations). *Chemical Geology;* **35**: No. 3-4, 205-225(Apr 1982).

Three characterized basalts and an associated secondary smectite were used in comparative uranium and cesium sorption studies. Experiments utilizing two synthetic characteristic basalt groundwaters at 23 and 60°C allowed comparison of increased temperature and carbonate concentration effects on Cs and U sorption. The sorption data were fitted to the Dubinin-Radushkevich (D-R) isotherm, and loading maxima and energetics derived. An increase in temperature caused a decrease in Cs sorption maxima on all solids from all groundwaters studied and an increase in U sorption maxima, especially from the higher-carbonate-content groundwater. Sorption energies were characteristic of ion exchange for both Cs and U sorption processes. Basalt U sorption maxima were relatively insignificant, but smectite U sorption maxima surpassed Cs sorption maxima in both groundwaters at 60°C. The uranyl carbonate complexes thus may be relatively temperature-sensitive. Upon removal of excess Fe-oxides from the secondary smectite, U sorption decreased and the D-R isotherm reverted to a normal Freundlich sorption isotherm. Removal of excess Fe-oxides from the basalts and secondary smectite would probably result in Freundlich sorption isotherms for both Cs and U.

5805 Oceanography

3116 **(SAND—82-7048) ISHTE deep-ocean corers and heater-implant system. Final report.** Olson, L.O.; Harrison, J.G. (Washington Univ., Seattle (USA). Applied Physics Lab.). Sep 1982. Contract AC04-76DP00789. 31p. D. Order Number DE83001000.

Portions of document are illegible.

Seafloor instrumentation systems are being developed for the In-Situ Heat Transfer Experiment (ISHTE) to determine the thermal conductivity of deep ocean sediments. As part of the experiment, a heat canister will be implanted into the sediment. Also, after about one year on the seafloor, core samplers are to be actuated to gather sediment samples. This report describes the deep ocean piston corers and the heater-implant drive system.

64 PHYSICS RESEARCH

6401 Astrophysics And Cosmology

REFER ALSO TO CITATION(S) 2676, 3109

3117 **(AD-A—111740/7) The solar coronal x-ray spectrum from 15.4 to 23.0 angstroms: lines from highly ionized calcium and chromium and their usefulness as plasma diagnostics.** McKenzie, D.L.; Landecker, P.B. (Aerospace Corp., El Segundo, CA (USA). Space Sciences Lab.). 7 Jan 1982. 44p. (TR—0082(2940-01)-2). NTIS, PC A03/MF A01.

Observations by the SOLEX experiment from the USAF P78-1 satellite are used to examine the 15.4 - 23.0 A X-ray spectrum from both flaring and nonflaring solar active region plasmas. High sensitivity, attained by summing data from several successive spectral scans, enabled the detection of more than 60 lines in this wavelength region. Most of the lines expected to be strongest from Cr XV-XVI and Ca XV-XVIII were detected; those undetected were obscured by blending. In addition, a blend of two Cr XVIII lines was observed, and three Cr XVIII lines are tentatively identified. Lines from higher ionization states of Cr are at shorter wavelengths and are hard to detect because of strong Fe emission. The Cr and Ca spectra are similar to those of isoelectronic species of Fe. The coronal abundances of Cr and Ca with respect to 0 are estimated; we find A(Cr)/A(0) = 0.0036 + or - 0.0018 and A(Ca)/A(0) = 0.015 + or - 0.005. We discuss the determination of these and other abundances by the analysis of X-ray spectra.

3118 **(AD-A—112873/5) Solar observations from the p78-1 satellite. Technical report.** Landecker, P.B.; McKenzie, D.L. (Aerospace Corp., El Segundo, CA (USA). Space Sciences Lab.). 15 Feb 1982. 33p. NTIS, PC A03/MF A01.

Five experiments on the p78-1 satellite have been recording solar data from February 1979 to the present time (August 1981). The SOLEX X-ray spectrometer/spectroheliograph experiment is a pair of collimated Bragg crystal X-ray spectrometers (3-25 angstroms). The MONEX monitor X-ray experiment uses two uncollimated X-ray proportional counters (0.05 through 12 angstroms). The SOLFLEX solar flare X-ray experiment uses four uncollimated Bragg crystal X-ray spectrometers near 1.9, 3.0, 3.2 and 8.4 angstroms. The MAGMAP magnesium mapping experiment uses two filtered proportional counters which view the sun through the SOLEX 60 arc sec collimator (8-12 angstroms). SOLWIND is a white light coronagraph viewing from 2.5 to 10 solar radii.

3119 **(AD-A—113084/8) Interferometric microwave polarimetry as a tool for short-term solar flare prediction. Report for 19 Feb 80-31 Mar 81.** Hurford, G.J. (California Inst. of Tech., Pasadena (USA)). Aug 1981. 29p. NTIS, PC A03/MF A01.

The purpose of this study is to look at a data base of interferometric solar microwave data in order to identify, evaluate and interpret preflare microwave signatures, with reference to their possible role in the short-term prediction of solar flares. Reserving the second half of this data base for verification of tentative results, 27 major flares were selected using optical, soft x-ray OR microwave flux criteria for which good quality interferometric data was available. These events were analysed in detail and very similar preflare signatures noted in four (15%) of the cases. The most common signature was a step-like increase in signal amplitude, accompanied by a decrease or reversal in the degree of polarization. Such a signature occurred between a few minutes to a few tens of minutes before the start of the impulsive phase. Optical data, available in three cases, showed the microwave changes were simultaneous with either small brightenings or small-scale filament disruptions. Preliminary results show that such microwave behavior occurs far too seldom for such an association with major flares to be a chance occurrence.

3120 **(CBPF-NF—006/82) Note on the breakdown of causality in a Goedel-like universe.** Reboucas, M.J. (Centro Brasileiro de Pesquisas Fisicas, Rio de Janeiro). 1982. 12p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82703146.

The problem of causality violation in a stationary, axially-symmetric, Goedel-like metric is examined when a massless scalar field S(z) is added to the source of Goedel's geometry.

3121 **(CBPF-NF—008/81) Time-dependent, Bianchi II, rotating universe.** Reboucas, M.J. (Centro Brasileiro de Pesquisas Fisicas, Rio de Janeiro). 1981. 12p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82703147.

An exact cosmological solution of Einstein's equations which has time-dependent rotation is presented. The t-constant sections are of Bianchi type II. The source of this geometry is a fluid which has not been thermalized.

3122 **(CBPF-NF—009/81) Time-dependent, finite, rotating universes.** Reboucas, M.J.; de Lima, A.S. (Centro Brasileiro de Pesquisas Fisicas, Rio de Janeiro). 1981. 22p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82703148.

Three new classes of finite, homogeneous and nonsingular solutions of Einstein's equations which have time-dependent expansion, shear and rotation are presented. The t-constant sections are of Bianchi type IX. The source of these geometries is a fluid which has not been thermalized.

3123 **(CBPF-NF—016/81) Pulsar slow-down epochs.** Heintzmann, H.; Novello, M. (Centro Brasileiro de Pesquisas Fisicas, Rio de Janeiro). 1981. 13p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82703149.

The relative importance of magnetospheric currents and low frequency waves for pulsar braking is assessed and a model is developed which tries to account for the available pulsar timing data under the unifying aspect that all pulsars have equal masses and magnetic moments and are born as rapid rotators. Four epochs of slow-down are distinguished which are dominated by different braking mechanisms. According to the model no direct relationship exists between 'slow-down age' and true age of a pulsar and leads to a pulsar birth-rate of one event per hundred years.

3124 **(CBPF-NF—045/81) Inelastic neutrino-nucleus scattering in highly evolved stars.** Kodama, T.; Duarte, S.B.; Chung, K.C. (Centro Brasileiro de Pesquisas Fisicas, Rio de Janeiro). 1981. 8p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82703150.

A complete expression of the neutrino-nucleus scattering cross section is presented. The relevance of the inelastic channels for the neutrino opacity in supernova problem is discussed.

3125 **(INIS-mf—6992) Solar radio bursts and their relation of coronal magnetic structures.** Kattenberg, A. (Rijksuniversiteit Utrecht (Netherlands)). 14 Oct 1981. 167p. NTIS (US Sales Only), PC A08/MF A01. Order Number DE82780746.

Thesis.

Following a general introduction, chapters II and III describe a model for coronal flux tubes. The model tube is a cylindrically symmetric localized force free current, that is embedded in a potential field. In both chapters the growth rates and sizes of the kink mode instability are calculated by solving the linearized equa-

tion of motion. In chapters IV and V, observations of solar Type-I radio bursts are presented and analysed. The observations were gathered with the 60-channel radio spectrograph in Dwingeloo. Chapters VI, VII, VIII, IX and X are concerned with observations of solar microwave bursts. The observations, with high time resolution (0.1 s) and high one-dimensional angular resolution (max. 4″) were made with the Westerbork Synthesis Radio Telescope.

3126 **(INIS-mf—6994) Radio emission in the Virgo cluster and in SO galaxies.** Kotanyi, C. (Rijksuniversiteit Groningen (Netherlands)). 15 Jun 1981. 159p. NTIS (US Sales Only), PC A08/MF A01. Order Number DE82780747.

Thesis.

A survey of the radio continuum emission from the galaxies in the Virgo Cluster is presented. The sample of 274 galaxies in total contains a subsample of 188 galaxies complete down to magntiude msub(p) = 14. The observations consisted mostly of short (10 minutes) observations providing one-dimensional (East-West) strip distributions of the radio brightness at 1.4 GHz, with an East-West resolution of 23″ allowing separation of central sources from extended emission, and an r.m.s. noise level of 2 mJy. The radio emission of SO galaxies is examined. A sample of 145 SO galaxies is obtained by combining the Virgo cluster SO's with the nearby noncluster SO's. The radio data, mainly from short observations, are used to derive the RLF. The radio emission in SO galaxies is at least three times weaker than that in ellipticals and spirals. Flat-spectrum compact nuclear sources are found in SO galaxies but they are at least 10 times weaker than in elliptical galaxies, which is attributed to the small mass of the bulges in SO's as compared to the mass of elliptical galaxies. The absence of steep-spectrum, extended central sources and of disk radio emission in SO's is attributed to their low neutral hydrogen content.

3127 **(INIS-mf—6995) Large-scale structure of molecular clouds.** Wouterloot, J. (Rijksuniversiteit Leiden (Netherlands)). 17 Sep 1981. 219p. NTIS (US Sales Only), PC A10/MF A01. Order Number DE82780748.

Thesis.

This thesis deals with the large-scale properties of molecular clouds. Most extensive studies of these clouds are made in ^{12}CO line at 2.6 mm and this line being optically thick, the analysis is strongly dependent on the much less abundant ^{13}CO. In addition there exists some discord about the abundance of CO with respect to H_2. The results of observations of large clouds in the local arm are presented: the clouds near Mon OB 1 and Mon OB 2, the Ophiuchus complex near Sco OB2 and the extended complexes of molecular clouds in Taurus. Observations of local clouds between l = 100° and l = 140° near the galactic plane are also discussed, as is the distribution of molecular clouds and other spiral arm tracers in the Perseus arm. The author concludes with a comparison of different models of cloud formation. In his opinion the model of Blitz and Shu agrees best with the observations in this part of the galaxy. However he considers it improbable that every individual cloud was formed in that way. It is more likely that a number of clouds with a range of sizes is formed at the same time and that they gradually move apart, which may be the situation in the Perseus arm around l = 110°.

3128 **(LA-UR—82-2348) Theoretical pulsations of the beta Cephei variable alpha Virginis.** Cox, A.N.; Hodson, S.W. (Los Alamos National Lab., NM (USA)). 30 Jul 1982. Contract W-7405-ENG-36. 5p. (CONF-8206101—5). NTIS, PC A02/MF A01. Order Number DE82021776.

From Conference on pulsations in classical and cataclysmic variable stars; Boulder, CO, USA (1 Jun 1982).

Portions of document are illegible.

A convective overshooting at the edge of the turbulently convective core of Beta Cephei variables is suggested, which causes periodic mixing of hydrogen into the otherwise depleted core. The extra pressure at the mixing shell, due to the newly added hydrogen gives periodic pushes on the envelope and the pulsations grow. For the specific model, 2 Virginis is used, having well-known mass, radius and luminosity. The recent stopping of the pulsations of this star may indicate that the proposed overshooting growth of the convective core may be temporarily terminated. (GHT)

3129 **(LA-UR—82-2844) Neutron star cooling: effects of envelope physics.** Van Riper, K.A. (Los Alamos National Lab., NM (USA)). 1982. Contract W-7405-ENG-36. 5p. (CONF-820884—2). NTIS, PC A02/MF A01. Order Number DE83001941.

From International Astronomical Union symposium on supernova remnants and their X-ray emission; Venice, Italy (29 Aug 1982).

Neutron star cooling calculations are reported which employ improved physics in the calculation of the temperature drop through the atmosphere. The atmosphere microphysics is discussed briefly. The predicted neutron star surface temperatures, in the interesting interval $200 \leqq t\ (yr) \leqq 10^5$, do not differ appreciably from the earlier results of Van Riper and Lamb (1981) for a nonmagnetic star; for a magnetic star, the surface temperature is lower than in the previous work. Comparison with observational limits show that an exotic cooling mechanism, such as neutrino emission from a pion condensate or in the presence of percolating quarks, is not required unless the existence of a neutron star in the Tycho or SN1006 SNRs is established.

3130 **(LA-UR—82-2989) Very high resolution calculations of very young supernova remnants.** Jones, E.M.; Smith, B.W. (Los Alamos National Lab., NM (USA)). 1982. Contract W-7405-ENG-36. 5p. (CONF-820884—1). NTIS, PC A02/MF A01. Order Number DE83002080.

From International Astronomical Union symposium on supernova remnants and their X-ray emission; Venice, Italy (29 Aug 1982).

After the supernova shock wave has swepted up about 8 to 10 stellar masses of interstellar material, the SNR structure is well described by blast wave theory. In fact, both numerical calculations of the early phases and small scale, laboratory simulations show transition to blast wave at 8 to 10 masses. In hindsight, we now know that the transition region between the photosphere (roughly 10^{-9} g/cm^3) and the circumstellar medium (10^{-24} g/cm^3) plays a crucial role. The shock wave is strongly accelerated down the density gradient, putting the shocked material behind into free expansion. When the shock encounters circumstellar material, it begins to decelerate. A second, reverse shock propagates into the stellar material that plows into the shocked circumstellar gas. All this happens on a timescale of days. The first attempts to include a description of the outer stellar envelop were aimed at analysis of the uv and X-Ray bursts produced when the shock wave reaches the photosphere. Falk and Arnett terminated their calculations before the shock reached the circumstellar gas. Chevalier mentions a reverse shock forming early but did not go into any details. We noticed and described the double-shock structure but, in hindsight, lacked sufficient resolution to produce the detailed structure between the shocks. Chevalier derived a similarity solution for the intershock region. In this paper we describe very high resolution calculations which reproduce and confirm the Chevalier similarity solution.

3131 **(PB—82-184748) Solar-geophysical data number 448, December 1981. Part II (comprehensive reports). Data for June 1981 and miscellanea.** Coffey, H.E. (National Geophysical and Solar-Terrestrial Data Center, Boulder, CO (USA)). Dec 1981. 51p. (SGD—448-PT-2). NTIS, PC A04/MF A01.

In addition to an index for 1980-81, this issue of comprehensive reports provides data for June 1981 on: solar radio emission, solar x-ray radiation, and mass ejections from the sun. Miscellaneous data includes active regions 1-29 May 1981, synoptic solar maps 1-29 May 1981, and solar flares -- internals of no flare patrol observation February 1980.

3132 **(PB—82-200932) Solar-geophysical data number 450, February 1982. Part II. (Comprehensive reports). Data for August 1981 and miscellanea.** Coffey, H.E. (National Geophysical and Solar-Terrestrial Data Center, Boulder, CO (USA)). Feb 1982. 76p. NTIS, PC A05/MF A01.

In addition to an index for 1981-1982, this issue of comprehensive reports provides data for August 1981 on solar radio emission, solar x-ray radiation, and mass ejections from the sun. Miscellaneous data includes active regions 29 May - 22 July 1981, synop-

tic solar maps 29 May - 22 July 1981, and energetic solar particles and plasma May 1980.

3133 **Hyperon composition of neutron stars.** Glendenning, N.K. (California Univ., Berkeley (USA). Lawrence Berkeley Lab.). *Physics Letters, [Section] B;* **114**: No. 6, 392-396(12 Aug 1982).

Neutron stars are studied in the framework of relativistic interacting field theory of nucleons, hyperons, and mesons. A large component of strange baryons is found, and in the interior the neutron population is minor.

3134 **γ-ray sources as comptonized X-ray sources.** Fenimore, E.E.; Klebesadel, R.W.; Laros, J.G.; Stockdale, R.E. (Los Alamos National Lab., NM (USA)); Kane, S.R. (California Univ., Berkeley (USA). Space Sciences Lab.). *Nature (London);* **297**: No. 5868, 665-667(24 Jun 1982).

In investigating the possibility that emission mechanisms based on Compton scattering can fit γ-ray burst spectra data, Monte Carlo calculations have been used to compare the data with black-body spectra which have undergone inverse comptonization by a much hotter, overlying plasma. The best-fit parameters suggests that the underlying black body is an X-ray source (kTsub(BB) approximately 2.4 keV) while the overlying, comptonizing plasma has kTsub(e) approximately 150 keV and a column density of 4 x 10^{24} electrons cm^{-2}. Such a model explains some of the unusual γ-ray burst spectra, such as the low energy (approximately 400 keV) cutoff in the spectrum of GB781119 (a Wien peak produced by a higher column density in the comptonizing region) and two-component spectra (a lower column density).

3135 **Gamma-ray burst source locations.** Evans, W.D. (California, University, Los Alamos Scientific Laboratory, Los Alamos, N. Mex.); Klebesadel, R.W. (NASA, Goddard Space Flight Center, Greenbelt, Md.); Laros, J.G. (CNR, Laboratorio di Tecnologie e Studio delle Radiazioni Extraterrestri, Bologna, Italy); Cline, T.L. (California, University, Los Angeles, Calif.); Desai, U.D. (Centre d'Etude Spatiale des Rayonnements, Toulouse, France). pp 229-234 of International cosmic ray conference. Vol. 1. Tokyo, Japan; University of Tokyo (1980).

From 16. international cosmic rays conference; Kyoto, Japan (6 Aug 1979).

Instrumentation for observing cosmic gamma-ray bursts has been provided for widely separated spacecraft, including the Pioneer Venus Orbiter, ISEE-3, Helios-B, Venera 10 and 11, and Prognoz 7. Simultaneous observations have been made of several gamma bursts with various combinations of these spacecraft and near-earth satellites. Locations of the gamma-burst sources have been calculated for those events where precise timing and ephemeris data are available. The results of optical and HEAO-B observations of the resultant error boxes will be discussed.

3136 **Nonlinear calculations for bump Cepheids.** Hodson, S.W.; Cox, A.N. (California Univ., Los Alamos, NM). pp 34-40 of Nonradial and nonlinear stellar pulsation. Berlin, Ger. Fed. Rep.; Springer-Verlag (1980).

From Nonradial and nonlinear stellar pulsation workshop; Tucson, AZ, USA (12 Mar 1979).

Using the Sengbusch-Stellingwerf relaxation method, hydrodynamic calculations have been carried out to find strictly periodic solutions for the fundamental mode pulsations of solar-mass-seven models. Specifically, the calculations deal with the so-called bump Cepheids which have periods between about 5.5 and 13 days. The results indicate that helium enrichment in the surface convection zones can adequately explain observations of bump Cepheids at evolution theory masses.

3137 **Nonlinear study of AI Velorum.** Cox, A.N.; Hodson, S.W. (California Univ., Los Alamos, NM). pp 41-49 of Nonradial and nonlinear stellar pulsation. Berlin, Ger. Fed. Rep.; Springer-Verlag (1980).

From Nonradial and nonlinear stellar pulsation workshop; Tucson, AZ, USA (12 Mar 1979).

Using results from earlier studies of double-mode dwarf Cepheids by Cox, King and Hodson (1979), hydrodynamic calculations have been undertaken for AI Vel. The evolution theory mass of 1.8 solar masses previously derived, together with a luminosity of 23 solar luminosity and a T sub e of 7500 K, give the observed period of 0.11 day and the observed period ratio pi sub 1/pi sub 0 0.773. Although the observed T sub e was 7620 K, a cooler T sub e is used due to the former's location at the fundamental pulsation mode blue edge. The composition used is X 0.70, Z 0.01 - a Z value lower than normal in order to make the period ratio as large as that observed. The goal is to see if double-mode behavior, due to either mode switching or a permanent state, can be predicted for the model. Progress in converging the model to a periodic pulsation solution by the von Sengbusch-Stellingwerf relaxation method is discussed.

6402 Atmospheric Physics

REFER ALSO TO CITATION(S) 1968, 2946

3138 **(AD-A—111822/3) Design and fabrication of quadrupole ion mass spectrometer for upper atmosphere. Final report 1 Oct 77-30 Sep 81.** LeBlanc, E.J. (Wentworth Inst., Boston, MA (USA)). 30 Sep 1981. 16p. NTIS, PC A02/MF A01.

The object of the Upper Atmosphere Research Program is the acquisition of knowledge of the physical and chemical properties of the upper atmospheric region by experimentation carried on with instrumentation borne aloft by probing rockets and balloons. The tasks assigned to Wentworth Institute of Technology during the term of this contract involved the design, fabrication, modification, assembly and testing of instrumentation. One major undertaking during the first part of the contract was the generation of a design layout of a Cluster Ion Mass Spectrometer. The initial design was developed through consultations between personnel at AFGL and WIT. These meetings led to the establishment of instrument design parameters. Assembly, subassembly and detail drawings were generated.

3139 **(AD-A—111825/6) Long-term intensity decrease in the 8-25 MeV proton fluxes at low l values. Scientific report no. 3, 1 Mar 80-28 Feb 81.** Parsignault, D.R.; Holeman, E.; Filz, R.C. (Emmanuel Coll., Boston, MA (USA). Physics Research Div.). Sep 1981. 21p. NTIS, PC A02/MF A01.

A five year continuous observation, 1963 to 1968, of the 8-25 MeV proton population, at L < 2.0, had shown a monotonic decrease in this population. We have observed the same proton population from 1970 to 1976, using experiments flown on several USAF satellites (72-1, S3-2, S3-3). These data together with published data from the DIAL satellite show that the decreases in the proton fluxes first observed from 1963 to 1968 have continued unabated, at least until August 1976, and with the same original mean lives. The proton flux at L = 1.35 decayed over the 13-year period (1963-1976) with a mean life, tau, of 5.7 + or - 0.5 years. At L = 1.90, tau was 4.55 + or - 0.16 years. However, the proton flux at L = 1.20, which had first been reported as constant, started decreasing approx. 1970 to 1976 with tau = 3.07 + or - 0.25 years. Possible explanations for this phenomenon can be divided into the two categories of natural and artificial effects. We reviewed these different effects and conclude that most likely we are seeing the decay of the high energy protons redistributed by the 'Starfish' high altitude nuclear explosion.

3140 **(AD-A—111826/4) Inverse scattering for electron density profile determination. Volume I. Final report 28 aug 80-30 oct 81.** Stone, W.R. (IRT Corp., San Diego, CA (USA)). 24 Sep 1981. 77p. (IRT—8205-003-VOL-1). NTIS, PC A05/MF A01.

The application of Exact Inverse Scattering Theory to the determination of the spatial distribution of ionospheric electron density is investigated. Vector field measurements and the effects of the earth's magnetic field are included. The uniqueness of the solution is proven for these cases. An exact analytic, closed-form solution for the source term in the inverse scattering problem is obtained. Practical and numerical aspects of using the techniques developed are examined.

3141 **(AD-A—111831/4) Statistical analysis of scintillation data.** Chua, S.; Noonan, J.P.; Basu, S. (Bedford Research Associates, MA (USA)). Sep 1981. 137p. (SCIENTIFIC—1). NTIS, PC A07/MF A01.

The Nakagami-m distribution has traditionally been used successfully to model the probability characteristics of ionospheric scintillations at UHF. This report investigates the distribution properties of scintillation data in the L-band range. Specifically, the appropriateness of the Nakagami-m and lognormal distributions is tested. Briefly the results confirm that the Nakagami-m is appropriate for UHF but not for L-band scintillations. The lognormal provides a better fit to the distribution of L-band scintillations and is an adequate model allowing for an error of + or - 0.1 or smaller in predicted probability with a sample size of 256.

3142 **(AD-A—111871/0) Comparison of ionospheric scintillation statistics from the North Atlantic and Alaskan sectors of the auroral oval using the wideband satellite. Environmental research papers.** Basu, S.; Basu, S.; Livingston, R.C.; Whitney, H.E.; MacKenzie, E. (Emmanuel Coll., Boston, MA (USA)). 15 Sep 1981. 132p. NTIS, PC A07/MF A01.

Phase and amplitude scintillation measurements made at 138 MHz at two widely separated auroral stations, Goose Bay, Labrador, and Anchorage, Alaska, are presented. The phase coherent transmissions obtained from the sun-synchronous Wideband satellite were used for this purpose. The data were obtained for part of the year 1979 during a high sunspot epoch and was terminated by the failure of the Wideband satellite in August, 1979. The primary objective of the report is the presentation of scintillation statistics in a manner required for communications system planning. The morphology at the two stations was found to be significantly different with more nighttime scintillations observed at Goose Bay, while many more daytime scintillations were observed at Anchorage during the same season. The report establishes the existence of L-shell aligned sheets in the daytime in addition to the well-established similar geometry at night. The existence of sheetlike irregularities during the daytime well-equatorward of the auroral oval is significant both from modeling and physical standpoints.

3143 **(AD-A—112004/7) Observation of field aligned ion and electron beams from SCATHA (p78-2). Technical report.** Richardson, J.D.; Fennell, J.F.; Croley, D.R. Jr. (Aerospace Corp., El Segundo, CA (USA)). 25 Feb 1982. 27p. (TR—0082(2940-05)-9). NTIS, PC A03/MF A01.

Intense field-aligned beams of ions and electrons have been observed by electrostatic analyzers on the SCATHA (P78-2) satellite. The beams have peaked energy spectra with energies ranging from tens of eV to several keV. These beams show a strong local time dependence, with occurrence frequencies peaking near local midnight. The occurrence frequencies of these beams are also positively correlated with Kp. Comparisons have been done with S3-3 observations of field-aligned ion fluxes, suggesting a direct relationship between acceleration of ions at low altitude in the auroral region and the observations of field aligned beams at the equator near synchronous orbit.

3144 **(AD-A—113088/9) A literature survey on inverse scattering for electron density profile determination. Volume II. Final report 28 Aug 80-30 Oct 81.** Stone, W.R. (IRT Corp., San Diego, CA (USA)). 24 Sep 1981. 52p. NTIS, PC A04/MF A01.

An extensive literature survey on the field of inverse scattering as it applies to determining the spatial distribution of electron density in the ionosphere is presented. The references are primarily from the period 1970-1981. Abstracts are included.

3145 **(AD-A—113138/2) Composition and structure measurements in an ionospheric barium cloud. Final report.** Narcisi, R.; Trzcinski, E.; Federico, G.; Wlodyka, L.; Bench, P. (Air Force Geophysics Lab., Hanscom AFB, MA (USA)). 23 Dec 1981. 31p. NTIS, PC A03/MF A01.

A 48 kg barium payload was launched from Eglin Air Force Base, Florida on 12 December 1980 at 2311 GMT and detonated at 183.7 km. At 2342:50.25 GMT, a second rocket, instrumented with an ion mass spectrometer and pulsed plasma probes, was fired to traverse the barium cloud. Composition, ion density, and structure measurements were acquired up to 241.2 km in both the natural and disturbed ionosphere. The rocket penetrated the barium cloud between 147 and 184 km. In addition to the Ba+, Ba++ produced by H Lyman alpha ionization, and Ca+, an impurity in the barium were detected in the cloud. A peak barium ion concentration of about 6,000,000 ions cu cm was measured at 161 km where the ionospheric NO+ and O2+ ions were essentially eliminated by large recombination loss. The bottom side of the barium cloud had a relatively smooth structure while the top side showed significant density fluctuations. The first experimental evidence of a theoretically predicted E region 'image cloud' was found in the form of an enhanced NO+ layer just below the barium cloud. Unexplained wave-like density variations in O+, NO+, and O2(+) also were seen above the barium cloud to 195 km. A quantitative estimate of the outgassing water vapor concentrations near the payload's surface was made using the fast change transfer rate coefficient for O+ + H2O yields H2O+ + O that created the observed water vapor ions.

3146 **(AD-A—113959/1) Proceedings of the Air Force Geophysics Laboratory workshop on the earth's radiation belts: 26-27 January 1981. Environmental research papers.** Sagalyn, R.C.; Spjeldvik, W.N.; Burke, W.J. (Air Force Geophysics Lab., Hanscom AFB, MA (USA)). 21 Oct 1981. 285p. NTIS, PC A13/MF A01.

A two-day workshop on the earth's radiation belts was held on 26-27 January 1981 at the Air Force Geophysics Laboratory. The workshop reviewed the present state of knowledge of the radiation belts and the effects of energetic particles on microelectronic systems. From this perspective it is possible to define the instrumentation requirements of future missions into the radiation belts. Proceedings of the workshop include: (1) reports on a tutorial session concerning the present level of understanding of radiation belt measurements, dynamics, wave-particle interactions, and their effects on microelectronic elements, (2) specifications of the state-of-the art instrumentation required to measure energetic particles, cold plasmas, magnetic fields, and waves, (3) overviews of existing statistical, numerical, and analytical models of the radiation belts, and (4) summaries of the sessions presented at the end of the workshop by the various session chairmen.

3147 **(AD-A—117497/8) Some physical and chemical aspects of striation structure. Interim report 1 Feb 79-15 Aug 80.** Goldman, S.R.; Sperling, J.L. (JAYCOR, San Diego, CA (USA)). 15 Aug 1980. 116p. NTIS, PC A06/MF A01.

In this report we assess a number of physical and chemical processes for their effect on striation structuring, with particular emphasis on times after a nuclear event, but prior to the re-establishment of the undisturbed ambient magnetic field. The results for charge exchange and impact ionization are particularly striking in that slow electron structure in the 100-200 km altitude range, due to fast ions created at an altitude of 400 km, exhibits a sharp decay with decreasing wavelength, at inverse wavenumbers below 20 kilometers.

3148 **(PB—82-187170) The use of theoretical models to improve global maps of fof2.** Rush, C.M.; PoKepner, M.; Anderson, D.N.; Stewart, F.G. (Department of Commerce, Boulder, CO (USA). Inst. for Telecommunication Sciences). Jan 1982. 50p. NTIS, PC A03/MF A01.

The results of a study to improve the global maps of monthly median values of the F2 region critical frequency, foF2, using values determined from a theoretical model, are presented. The object of the study was to obtain values of the mid-latitude F-region critical frequency which could be used to improve the prediction of ionospheric parameters in regions of the earth inaccessible to ground-based measurements. This was accomplished by including, into the theoretical calculations, realistic physical processes along with a realistic geomagnetic field model. Parameters were adjusted so that agreement was achieved between calculated and observed foF2 values as a function of local time at different stations and then these same input parameters (i.e., neutral wind field, neutral atmospheric model, electrodynamic drift) were assumed valid

at all regions of interest where the major difference is the gemagnetic fieldline configuration.

3149 (PB—82-196395) International reference ionosphere-IRI 79: report of URSI working group G.4 (identical with COSPAR task group on international reference ionosphere). Lincoln, J.V.; Conkright, R.O. (World Data Center A for Solar-Terrestrial Physics, Boulder, CO (USA)). Nov 1981. 253p. NTIS, PC A12/MF A01.

This report is the second edition of the International Reference Ionosphere (IRI) succeeding the first one, IRI 1978, and edited by the International Scientific Radio Union (URSI). The aim of the IRI is to establish a summary compendium of height profiles through the ionosphere for the four main plasma parameters, namely: plasma density, plasma temperatures of electrons and ions, and ion composition. These parameters are generated from a descriptive model containing reliable data that can be extracted and used to obtain average profiles. The IRI-generated parameters compare well with COSPAR International Reference Atmosphere (CIRA) values (last edition CIRA 1972). The emphasis of IRI is to summarize reliable experimental data when available.

6403 Atomic, Molecular, And Chemical Physics

REFER ALSO TO CITATION(S) 2769, 2770, 2771, 3184, 3524

3150 (AD-A—111984/1) Particle beam chemistry studies. Final report, 12 May-30 September 1981. Scheibe, M. (Mission Research Corp., Santa Barbara, CA (USA)). 12 Nov 1981. 15p. (MRC-R—673). NTIS, PC A02/MF A01.

Calculations were made of the chemistry in the channel left by a high intensity particle beam pulse. It was found that, because of the high temperature of the gas in the channel, the electron density was determined almost exclusively by electron-ion recombination. The role of nitrogen vibration in determining the temperature was also investigated.

3151 (AD-A—113580/5) Collisions of ions in gases. Final report Aug 75-Feb 79. Bailey, T.L. (Florida Univ., Gainesville (USA). Dept. of Physics). 31 Mar 1982. 20p. NTIS, PC A02/MF A01.

This report is a summary description of research carried out under the ONR Project 'Collisions of Ions in Gases'. The work consisted of experimental studies of collisions of low-energy ions (4 < or = E sub L < or = 500 eV) with atoms and molecules, using the ion-beam gas-target technique, and of theoretical and computational studies done in support of the experiments. Three types of experiments were carried out: (a) measurements of relative differential cross-sections for elastic and inelastic (i.e., charge transfer) scattering in collisions of the He(++) ions with Ne, Ar, and Kr atoms, over the ion energy range 8 < or = E sub L < or = 60 eV; (b) kinematical studies of charge transfer in collisions of 30 < or = E sub L < or = 373 eV Ne(+), Ar(+), and Kr(+) ions with H2, D2, O2, and N2 molecules, in which the KE-distributions of the product H2(+), etc., were measured; and (c) measurements of the absolute total cross-sections for the charge transfer process He(++) + R = He(+) + R(+), where R = Ne, Ar, Kr, over the energy range 4 < or = E sub L < or = 500 eV. The experimental results, and their interpretations in terms of appropriate quantum scattering theory (where the latter was feasible) are discussed briefly. The effects of the thermal motions of collision participants (i.e., thermal broadening) in ion-atom and similar scattering experiments were investigated in computational studies, and a new crossed ion-supersonic atom/molecule beams apparatus, designed to remove the thermal broadening effect and to give high resolution in energy and angle, is discussed.

3152 (AD-A—113753/8) Investigation of electron collision processes in $HgBr_2$. Final report 15 Feb 81-14 Apr 82. Nighan, W.L.; Hinchen, J.J.; Wiegand, W.J. (United Technologies Research Center, East Hartford, CT (USA)). 14 Apr 1982. 50p. NTIS, PC A03/MF A01.

Cross sections for mercuric bromide (HgBr2) dissociative attachment and ionization have been measured using an electron beam experiment. The dominant products of these reactions, as identified by mass analysis, are Br (-) and $HgBr_2(+1)$. A complementary electron swarm experiment was used to determine the ion production coefficients in a variety of gas mixtures containing $HgBr_2$. The measured ion production coefficients were found to be in excellent agreement with the attachment and ionization coefficients computed using the measured cross sections. Additionally, analysis of the variations in the measured $HgBr_2$ ion production coefficients along with measured electron drift velocity variations is found to be consistent with the interpretation that vibrational excitation of HgBr2 is dominated by a resonance in the 3-5 eV electron energy range for which dissociative attachment is observed to occur.

3153 (CEA-R—5171) Study and utilization of ion beams created in the Focus experiment. Bernard, A.; Garconnet, J.P.; Jolas, A.; Le Breton, J.P.; de Mascureau, J. (CEA Centre d'Etudes de Limeil, 94 - Villeneuve-Saint-Georges (France)). Jun 1982. 45p. (In French). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82702995.

Ion beams created in a plasma focus electrical discharge are evidenced and measured from interaction with CD_2 and DLi targets. Aluminum targets are also used with observation of the radiation temperature and material expansion velocity. Comparison between experimental measurements and numerical computations allows to determine energy deposition in the aluminum foil as well as beams values. With the 200 kJ Actime facility 2 to 3 MJ/g deposition is obtained in aluminum on approximately one square centimeter. A fast valve gas injection has been developed on another facility and preliminary results are given.

3154 (DOE/ER/02567—8) Energetics of the formation and reactions of gaseous ions. Annual progress report for the period September, 16, 1981 to September 15, 1982. Meisels, G.G. (Nebraska Univ., Lincoln (USA). Dept. of Chemistry). Sep 1982. Contract AC02-76ER02567. 24p. (COO—2567-8). NTIS, PC A02/MF A01. Order Number DE83000290.

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Research is reported in these areas: range and linear ionization rates of low energy electrons; ion fragmentation from nonisterconverting states; competition between isomerization and fragmentation of gaseous ions; precise thermodynamic measurements of gas phase ionic equilibria; and instrumental analyses and developments. (GHT)

3155 (DOE/ER/02753—179) Atomic physics with highly charged ions. Progress report, 1 June 1981-31 July 1982. Richard, P. (Kansas State Univ., Manhattan (USA). Dept. of Physics). Jul 1982. Contract AC02-76ER02753. 13p. NTIS, PC A02/MF A01. Order Number DE83000226.

Research is reported with brief summaries of the following areas; single and double K-shell electron transfer; direct K-shell ionization and K-shell excitation in symmetric vs. asymmetric systems; electron capture involving low-energy highly-stripped projectiles; and calculations of electron capture at high velocity. (GHT)

3156 (DOE/ER/04676—8) Atomic and molecular sciences. Progress report No. 9, April 1, 1982-March 31, 1983. Walters, G.K.; Lane, N.F. (Rice Univ., Houston, TX (USA). Dept. of Physics). 1982. Contract AS05-76ER04676. 57p. NTIS, PC A04/MF A01. Order Number DE83000872.

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The atomic and molecular physics program at Rice University addresses fundamental problems in structure,radiation-induced gas- and condensed-phase reaction kinetics and dynamics, and the mutual interactions of radiation, atoms, molecules, electrons and ions, particularly in highly unusual or exotic environments. The program emphasizes fundamental studies relating to new sources of energy, with close interaction between experimental and theoretical aspects of the research. Progress in the experimental program is reported in three principal areas: (A) gaseous electronics, (B) reactions in a flowing helium afterglow, and (C) spin-polarized beams and spin-polarimetry.

3157 **(DOE/ER/10831—2) Depopulation rates for combustion-related species in long-lived vibrationally or electronically excited levels. Technical progress report, 16 July 1981-1 September 1982.** Field, R.W.; Kinsey, J.L. (Massachusetts Inst. of Tech., Cambridge (USA). Dept. of Chemistry). 1982. Contract AC02-81ER10831. 9p. NTIS, PC A02/MF A01. Order Number DE83000291.

Portions of document are illegible.

Progress is reported in the following areas: stimulated emission spectroscopy of acetylene, quantum beat spectroscopy of acetylene, and two photon excitation spectrum of the CO $D^1\Delta$-$X\ ^1\Sigma^+$ systems. (WHK)

3158 **(GKSS—78/E/24) Algorithms for the different steps in the numerical solution of partial differential equations and application to the design of an ion extraction system.** Haeuser, J.; Tanzer, F. (GKSS-Forschungszentrum Geesthacht G.m.b.H., Geesthacht-Tesperhude (Germany, F.R.)). 1978. 20p. Dep. NTIS (US Sales Only), MF A01. Order Number DE82750528.

In the process of numerically solving partial differential equations four main problems arise, viz. a) the description of the boundary, b) the determination of all grid points lying within the solution area, c) the treatment of boundary conditions (Dirichlet, v. Neumann, Cauchy) on irregular boundaries, and d) the solution of the system of coupled equations including stability analysis and computer time considerations. The algorithms developed have a wide range of applicability as may be seen by their use in the modeling of the thermal impact of power plants (thermal plumes etc.), in calculating two-dimensional flow fields, and in constructing the ion trajectories of an ion extraction system.

3159 (INIS-mf—6819, pp 280) **Influence of exchange effect on chemical changes of inner electrons capture probability.** Boruta, I.I.; Makaryunas, K.V. 1981. (In Russian). NTIS (US Sales Only), PC A99/MF A01.

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

3160 (INIS-mf—7059-Vol.2, pp vp) **Analysis of metallic layer systems by Rutherford backscattering spectrometry.** Hehl, K.; Weber, B. (Friedrich-Schiller-Universitaet, Jena (German Democratic Republic). Sektion Physik). 1981. NTIS (US Sales Only), PC A22/MF A01.

From International conference on amorphuos systems investigated by nuclear methods; Balatonfuered, Hungary (31 Aug 1981).

The annealing behavior of Al/Cr/Al and Al/Ni/Al layer systems was investigated by means of the RBS method. Depending on annealing temperature and time, relatively stable compound layers or grains grow to the surface. The existence of the grains was confirmed by SEM and roughness measurements.

3161 **(INIS-mf—7094) Application of positron annihilation techniques to the study of micels and microemulsions.** Olea C, O. (Universidad Autonoma del Estado de Mexico, Toluca. Escuela de Ciencias Quimicas). 1981. 161p. (In Spanish). NTIS (US Sales Only), PC A08/MF A01. Order Number DE82780808.

Thesis.

The molecular auto-association mechanisms in sodium-oleate-alcohol-alkane-water systems were studied, applying positron and positronium annihilation techniques. The effects of the different component structures of these systems and of their concentrations on the swelled micel formation process which eventually produce microemulsions, were also investigated. The influences studied were: (a) co-surfactant (alcohol) hydrocarbon chain lengths, (b) alkane (oil) hydrocarbon chain lengths, (c) surfactant concentrations, and (d) surfactant double link alkylic chains.

3162 **(INIS-mf—7148) Dynamic theory of the production of positrons in collisions of very heavy ions.** Reinhardt, J. (Frankfurt Univ. (Germany, F.R.). Fachbereich Physik). 8 Jan 1980. 217p. (In German). NTIS (US Sales Only), PC A10/MF A01. Order Number DE82780807.

Thesis.

In the present thesis the resulting excitation processes were quantitatively studied. For this at first the semiclassical model for electronic excitations of the one- and many-body system was discussed. It has been shown that it is mostly convenient to use the quasimolecular model. For the calculation of energies and matrix elements the two-center Dirac equation was solved in monopole approximation. The production of K-holes, delta-electrons, and especially the positron emission was calculated by perturbation theory and numerical solution of the coupled-channel equations.

3163 (INIS-SU—125, pp 159) **Nuclear polarization in the muonic atoms.** Zaretskij, D.F.; Karpeshin, F.F. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3164 (INIS-SU—125, pp 161) **Radiationless excitation of the nucleus in the muonic atoms.** Karpeshin, F.F. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3165 (INIS-SU—125, pp 172) **Contribution of pion absorption to the mesic atom L not equal to 0 level widths.** Birbrair, B.L.; Kalashnikov, Yu.A. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3166 (INIS-SU—125, pp 173) **Excitation of two nucleons into continuum as an entrance process for bound pion absorption by nuclei and the 1s mesic atomic level widths.** Birbrair, B.L.; Kalashnikov, Yu.A. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3167 (INIS-SU—125, pp 230) **Symmetric and nonsymmetric decays of three-particle nuclear molecular states.** Zhukov, M.V. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3168 (INIS-SU—125, pp 242) **Nuclear states of the (core+alpha) type and the interacting boson model.** Chekh, J. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3169 (INIS-SU—125, pp 243) **Algebraic realization of resonating-group method for the ^{4}He-^{16}O system.** Bystrenko, A.V. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3170 (INIS-SU—125, pp 527) **Spectrometer for measuring the slow positron lifetime in metals.** Belyaev, V.N.; Kovalen, V.Yu.; Melikhov, A.P.; Shtotskij, Yu.V. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3171 (INIS-SU—125, pp 528) **Measuring the positron implantation profile.** Mokrushin, A.D.; Khvostov, D.V. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3172 **(JINR—E-7-81-278) Impact parameters dependence of K-shell vacancy production in collisions of 1 MeV/a.m.u. Cu ions with Cu, Ge and Ag atoms.** Frank, W.; Jaracz, P.; Kaun, K.H.; Rudiger, J.; Stachura, Z. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Reactions). 1981. 10p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702991.

For the purpose of studying the mechanism of K-shell vacancies production by means of registering characteristic X-rays in scattered ion coincidences the $^{63}Cu^{4+}$ ion interaction with 63 MeV energy with thin Cu, Ge and Ag targets has been studied. The experimentally obtained dependence of K-shell vacancies production probability on collision parameter is neither satisfactorily described by the model of the rotational coupling of the $2p\pi$-$2p\sigma$ levels nor by the statistic electron diffusion model. For the Cu-Ge system the dependence of the process of vacancies sharing on the collision parameter is also determined. A satisfactory agreement with the Briggs-Meyerhof- Demkov model predictions being observed.

3173 **(JINR—P4-82-418) Calculations of the ion-ion interaction potentials in local-scale transformation method.** Stoitsov, M.V. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics). 1982. 13p. (In Russian). Joint Inst. for Nuclear Research, Dubna, USSR.

The possibility for application of the local-scale transformation method in Hartree-Fock approximations for the determination of the ion-ion interaction potentials is considered. For realistic calculations it is convenient to use the obtained one-particle basis, which reproduces the results of the stationary Hartree-Fock problem with satisfactory accuracy and has simple analytic form. The ion-ion potentials are calculated with the Skyrme forces when neglecting the antisymmetrization effects and also partially taking them into account for all pairs of interacting spherical nuclei: ^{4}He, ^{16}O, ^{40}Ca, ^{90}Zr, and ^{208}Pb. The changes in the ion-ion potentials, caused by the use of the oscillator bases wave functions instead of the Hartree-Fock ones, are considered.

3174 **(JINR—P11-82-314) Construction of initial approximations by parameter-variation method for Newton calculation scheme for eigenvalue problem.** Vinitskii, S.I.; Gocheva, A.D.; Puzynin, I.V. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Computing Techniques and Automation). 1982. 10p. (In Russian). Joint Institute for Nuclear Research, Dubna, USSR.

The algorithm for solving eigenvalue problem for the integro-differential operator is constructed. It is based on the parameter-variation method and the Newton iterations with the additional orthogonality condition for eigenfunctions. The initial condition for the iterations is obtained by solving a simpler problem of a differential equation. The algorithm is applied to calculate energy levels and radial functions of the hydrogen atom. The solution of the problem of a particle moving in a spherical box is used as zeroth order approximation. In the iterations the zeroth order operator is inverted, and the difference between it and the original operator, that contains the Coulomb potential, is further considered as a perturbation. The present approach is convergent in a wider range of problems than the perturbation theory scheme.

3175 **(JINR—P15-82-320) Experimental determination of partial probabilities for atomic capture of muons during their lifetime in mesonic atoms.** Evseev, V.S.; Mamedov, T.N.; Roganov, V.S.; Kholodov, N.I.; Frontas'eva, M.V. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems). 1982. 13p. (In Russian). Joint Institute for Nuclear Research, Dubna, USSR.

The paper considers a method of determination of partial probabilities for atomic capture of muons through the time distribution of electrons from $\mu^- - e^-$-decay of a bound muon in multicomponent targets. The paper includes the results of adjusting measurements for determination of values of the solid angle of the electronic telescope for different targets under the bad geometry conditions. The analysis of errors due to the introduction of various corrections is done.

3176 **(LBL—14857) Resonance and threshold effects in photoemission up to 3500 eV.** Shirley, D.A.; Kobrin, P.H.; Lindle, D.W.; Truesdale, C.M.; Southworth, S.H.; Becker, U.; Kerkhoff, H.G. (Lawrence Berkeley Lab., CA (USA); California Univ., Berkeley (USA). Dept. of Chemistry; Technische Univ. Berlin (Germany, F.R.). Fachbereich Physik). Aug 1982. Contract AC03-76SF00098. 16p. (CONF-820855—4). NTIS, PC A02/MF A01. Order Number DE83000515.

From International conference on X-ray and atomic inner-shell physics; Eugene, OR, USA (23 Aug 1982).

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Beam lines at the Stanford Synchrotron Radiation Laboratory (SSRL) now provide photon beams throughout the entire energy range 5 to 5000 eV, with a pulse structure very well-suited to time-of-flight (TOF) photoelectron spectroscopy. We have used this facility, together with a TOF spectrometer, to measure photoemission cross sections $\sigma(\epsilon)$ and asymmetry parameters $\beta(\epsilon)$ for several interesting systems. A summary of early results is given. Metal vapors (Ba, Cd, Mn, Hg) were studied using a high-temperature oven. Resonant photoemission was observed in several cases. Both $\sigma(\epsilon)$ and $\beta(\epsilon)$ showed resonant behavior at 21.1 eV for several lines in Cd. The 4d, 5s, and 5p $\sigma(\epsilon)$ line profiles differed dramatically, illustrating the detailed information about continuum states that is available from photoemission. Correlation satellites in photoemission from rare gases have been observed over a very wide energy range, including those seen in the K-shells of He, Ne and Ar and in the L-shell of Ne. The structure and preliminary intensity variations of these satellites will be discussed. Molecular shape resonances in C(1s), N(1s), and O(1s) photoemission were observed for the first time, in the molecules CO, CO_2, OCS, CF_4, N_2 and NO. Both the π and σ resonances were observed in KVV Auger emission, and the σ resonances were studied by photoemission. The asymmetry parameters were measured in all cases. The results are in fair agreement with theory, but show systematic deviations and trends. 31 references.

3177 **(ORNL/TM—8453) Electron-ion collisions.** Crandall, D.H. (Oak Ridge National Lab., TN (USA)). Sep 1982. Contract W-7405-ENG-26. 59p. NTIS, PC A04/MF A01. Order Number DE83000421.

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This discussion concentrates on basic physics aspects of inelastic processes of excitation, ionization, and recombination that occur during electron-ion collisions. Except for cases of illustration along isoelectronic sequences, only multicharged (at least +2) ions are specifically discussed with some emphasis of unique physics aspects associated with ionic charge. The material presented is discussed from a primarily experimental viewpoint with most attention to electron-ion interacting beams experiments. In the spirit of a NATO Advanced Study, this presentation is intended for persons who are not already experts in the subject but who want to gain some basic understanding of the field and a flavor of current research activities in the field. Two previous NATO Advanced Studies contain a number of papers which relate directly to the present topic and will be specifically referenced. In addition there are a number of recent reviews or overviews of specific parts of the present topic which can be relied on for some details. 86 references.

3178 **(SAND—82-1698C) Surface spectroscopy using high-energy heavy ions.** Doyle, B.L.; Peercy, P.S.; Gray, T.J.; Cocke, C.L.; Justiniano, E. (Sandia National Labs., Albuquerque, NM (USA); Kansas State Univ., Manhattan (USA). Dept. of Physics). 1982. Contract AC04-76DP00789. 3p. (CONF-821123—2). NTIS, PC A02/MF A01. Order Number DE83001269.

From Conference on application of accelerator in research and industry; Denton, TX, USA (10 Nov 1982).

Surface atoms ionized by high energy heavy ions have been detected by time-of-flight and quadrupole mass spectroscopic techniques. The experimental arrangements are described and potential applications are suggested. Both techniques are demonstrated to produce significant improvements in the detection of atomic hydrogen, with the TOF method producing a nine order of magnitude increase in the sensitivity of atomic hydrogen compared to standard nuclear analysis methods.

3179 **(SAND—82-2299C) Electron- and photon-stimulated desorption.** Knotek, M.L. (Sandia National Labs., Albuquerque, NM (USA)). 1982. Contract AC04-76DP00789. 15p. (CONF-820855—5). NTIS, PC A02/MF A01. Order Number DE83001285.

From International conference on X-ray and atomic inner-shell physics; Eugene, OR, USA (23 Aug 1982).

Electron and Photon Stimulated Desorption (ESD and PSD) have recently received growing attention because of their ability to provide highly specific information on the surface bond. In one sense, stimulated desorption can serve as an electronic and structural probe specific to the desorbed species and its surface bonding environment. This arises from our knowledge of the excitation processes which initiate desorption, and the intrinsic electronic properties of the surface which govern desorption processes. Alternatively the desorption experiment can provide insight into the dynamics of charge motion in the surface bond. The desorption process is a complex interplay between electronic and nuclear motions which occur in response to the highly energetic and localized electronic excitations which are known to induce desorption. The mechanisms of desorption, desorption modeling in covalent systems, and desorption spectroscopy are discussed. 71 references. (WHK)

3180 **Beam-foil spectra for 15-160 MeV Zr at wavelengths from 6-60 nm.** Kruse, T.H. (Rutgers - the State Univ., New Brunswick, NJ (USA)); Cecchi, J.L. (Princeton Univ., NJ (USA). Plasma Physics Lab.); Johnson, B.M.; Gregory, D.C.; Jones, K.W. (Brookhaven National Lab., Upton, NY (USA)). *Physics Letters [Section] A;* **90**: No. 6, 284-287(19 Jul 1982).

Beam-foil spectra have been measured for zirconium beams at 15, 22, 50, 78, 140, and 160 MeV corresponding to calculated mean charge states of 11, 13, 18, 21, 25, and 26, respectively. The spectra for XUV radiation (6-60 nm) are compared with similar results obtained from other experiments.

3181 **Molecular-ion structures determined from Coulomb explosions of penetrating ions.** Gemmell, D.S. (Argonne National Lab., IL (USA)). pp 841-860 of Physics of electronic and atomic collisions. Invited papers of the 12th international conference held at Gatlinburg, TN, USA, 15-21 July, 1981. Datz, S. (ed.). Amsterdam, Netherlands; North-Holland (1982).

From 12. IPEAC international conference on the physics of electronics and atomic collisions; Gatlinburg, TN, USA (15 Jul 1981).

Traditional experimental techniques (e.g. studies on photon absorption or emission) for determining the stereochemical structures of neutral molecules are extremely difficult to apply to molecular ions because of problems in obtaining a sufficient spatial density of the ions to be studied. Recent high-resolution measurements on the energy and angle distributions of the fragments produced when fast (MeV) molecular-ion beams from an electrostatic accelerator dissociate in thin foils and in gases, offer promising possibilities for deducing the stereochemical structures of the molecular ions constituting the incident beams. The authors describe this "Coulomb explosion" technique and give some examples of its use in structure determinations.

6404 Fluid Physics

REFER ALSO TO CITATION(S) 3158

3182 **(AD-A—111842/1) Propagation of sound in matter. Interim summary report, 1 October 1968-1 February 1982.** Rudnick, I. (California Univ., Los Angeles (USA). Dept. of Physics). Mar 1982. 44p. NTIS, PC A03/MF A01.

Contents: Ultrasonic Attenuation in Liquid Helium at 1 GHz; Size Effects in Liquid Helium II as Measured by Fourth Sound and The Attenuation of Fourth Sound; Third Sound in Unsaturated Films of Superfluid Helium; A Specific Heat and Fourth Sound Measurement of Size Effects in Liquid Helium; Experimental Study of the Lambda Transition of Liquid Helium Using First Sound Attenuation; Attenuation of Third Sound in Liquid Helium and the Stability of Multiply Quantized Persistent Circulations of a Thin Helium Film in the Landay Region; Hypersonic Attenuation in the Vicinity of the Superfluid Transition of Liquid Helium; Investigation of Persistent Current States in Rotating Superfluid Helium Contained in Superleak Using Doppler-Shifted Fourth Sound; Investigation of the thickness and Critical Velocity of a Moving Unsaturated Superfluid Film Using Doppler Shifted Third Sound; Third Sound Velocity and Attenuation Below 1.2 Degrees Kelvin; A Study of the Trapping of Superfluid Persistent Currents in Superleaks; Non-Linear Parametric Generation of Sound by Resonant Mode Conversion; A Study of Persistent Currents in Superfluid 4He.

3183 **(BNL—31916) Liquid helium.** Svensson, E.C. (Brookhaven National Lab., Upton, NY (USA); Atomic Energy of Canada Ltd., Chalk River, Ontario). Sep 1982. Contract AC02-76CH00016. 7p. (CONF-820950—4). NTIS, PC A02/MF A01. Order Number DE83001302.

From Conference on the neutron and its applications; Cambridge, UK (13 Sep 1982).

Portions of document are illegible.

Recent neutron-scattering studies on liquid ^{4}He which have led to a simplified interpretation of the dynamics and to new values for the condensate fraction are summarized.

3184 **(JINR—P5-82-293) Thermal conductivity coefficient of molecular gases.** Rogov, V.S.; Shirkov, P.D. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Computing Techniques and Automation). 1982. 9p. (In Russian). Joint Institute for Nuclear Research, Dubna, USSR.

A simple expression for the calculation of diffusion component of thermal conductivity in assumption of a local thermodynamic equilibrium has been derived from the kinetic theory. Comparison with the theory of other authors is made.

3185 (INIS-mf—7127, pp 45) **Measurement of particle velocity in gas flows.** Glatt, I.; Manor, D.; Bar-Ziv, E. (Israel Atomic Energy Commission, Beersheba. Nuclear Research Center-Negev). [nd]. NTIS (US Sales Only), PC A04/MF A01.

From Workshop on plasma chemistry in technology; Ashkelon, Israel (30 Mar 1981).

6450 High Energy Physics

3186 **Review of particle properties.** Roos, M. (Helsinki Univ. (Finland). Dept. of High Energy Physics); Porter, F.C. (California Inst. of Tech., Pasadena (USA). Dept. of Physics); Aguilar-Benitez, M.; Montanet, L.; Walck, C. (European Organization for Nuclear Research, Geneva (Switzerland)); Crawford, R.L. (Glasgow Univ. (UK). Dept. of Natural Philosophy); Kelly, R.L.; Rittenberg, A.; Trippe, T.G.; Wohl, C.G. (California Univ., Berkeley (USA). Lawrence Berkeley Lab.). *Physics Letters, [Section] B;* **111**: 1-294(22 Apr 1982).

This review of the properties of leptons, mesons, and baryons is an updating of Review of Particle Properties, Particle Data Group [Rev. Mod. Phys. 52 (1980) No. 2, Part II]. Data are evaluated listed, averaged, and summarized in tables. Numerous tables, figures, and formulae of interest to particle physicists are also included. A data booklet is available.

6451 Particle Interactions And Properties - Experimental

REFER ALSO TO CITATION(S) 2818, 2855, 2864, 3124, 3258, 3321

3187 **(BNL—31885) Detecting supersymmetric hadrons.** Aronson, S.H.; Littenberg, L.S.; Paige, F.E.; Stumer, I.; Weygand, D.P. (Brookhaven National Lab., Upton, NY (USA)). 1982. Contract AC02-76CH00016. 6p. (CONF-8206120—4). NTIS, PC A02/MF A01. Order Number DE83000841.

From Elementary particle physics and future facilities summer study; Snowmass, CO, USA (1 Jun 1982).

Supersymmetric grand unified models are of interest because they offer a possible explanation of the great disparity between the W mass and the grand unified scale (about 10^{15} GeV). In such models each of the familiar particles (gluons, quarks, etc.) has a partner differing by 1/2 unit of spin, presumably with a mass of order the W mass or less. Supersymmetry ensures that the couplings of the partners of the gluons and quarks to normal hadronic constituents are of about the usual QCD strength. Thus production

cross-sections for these states need not be particularly small. In the present paper we investigate the possibility of detecting the supersymmetric partners of gluons and quarks at a 400 x 400 GeV/c proton-proton collider.

3188 **(BNL—31957) Measurement of the nu/sub μ/ charged-current cross section.** Baker, N.J.; Connolly, P.L; Kahn, S.A. (Brookhaven National Lab., Upton, NY (USA); Columbia Univ., New York (USA); Rutgers--the State Univ., New Brunswick, NJ (USA)). 1982. Contract AC02-76CH00016. 12p. (CONF-820675—4). NTIS, PC A02/MF A01. Order Number DE83001307.

From International conference on neutrino physics; Balaton, Hungary (14 Jun 1982).

The Fermilab 15-ft bubble chamber, filled with a heavy neon-hydrogen mix, was exposed to a narrow band nu/sub μ/ beam. Based on the observation of 830 charged current nu/sub μ/ interactions, the cross section was found to rise linearly with the neutrino energy in the interval, 10 GeV ≦ E/sub nu/ ≦ 240 GeV, with a constant slope of: σ/sub nu/E/sub nu/ = (0.64 +- 0.05) 10^{-38} cm^2 GeV^{-1}. This result is discussed in relation to other experiments.

3189 **(BNL—31997) Low and medium (~ 30 GeV/c) P/ sub t/ physics at ISABELLE.** Lindenbaum, S.J. (Brookhaven National Lab., Upton, NY (USA)). 1982. Contract AC02-76CH00016;AC02-79ER10550. 2p. (CONF-8206116—5). NTIS, PC A02/MF A01. Order Number DE83001303.

From Workshop on division of particles and fields of the APS; Aspen, CO, USA (28 Jun 1982).

Portions of document are illegible.

Forward Angle Physics that can only be done at ISABELLE is considered: (1) p-p total cross section; (2) real part of the p-p elastic forward scattering amplitude; and (3) p-p differential elastic scattering cross section.

3190 **(BONN-HE—81-27) Inclusive charged pion photoproduction on ^{12}C using tagged photons in the energy range (200-390) MeV.** Arends, J.; Eyink, J.; Hartmann, H.; Hegerath, A.; Mecking, B.; Noeldeke, G.; Rost, H. (Bonn Univ. (Germany, F.R.). Physikalisches Inst.). Nov 1981. 27p. Dep. NTIS (US Sales Only), MF A01. Order Number DE82750559.

The photoproduction of charged pions on ^{12}C has been investigated using the tagged photon beam facility at the Bonn 500 MeV synchrotron. Pions were detected in a broad range magnetic spectrometer. Double differential cross sections for pion emission at fixed photon energies are presented. The integration of the measured distributions yields the total cross section for inclusive pion production. The data are compared to the predictions of a simple model that takes the quasifree production of pions and their subsequent scattering and reabsorption into account.

3191 **(CEA-N—2251) Spectroscopy of hypernuclei.** Catz, H. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France); Paris-11 Univ., 91 - Orsay (France)). Dec 1981. 168p. (In French). NTIS (US Sales Only), PC A08/MF A01. Order Number DE82702802.

Thesis.

Recent technological developments regarding secondary beams, magnetic spectrometers and detectors have made it possible to use electronic counter techniques to study hypernuclei. The in-flight strangeness exchange reaction $K^- + AZ \rightarrow \pi^- +$ sub(Λ)AZ is kinematically the most favorable. To undertake this experimental study, at Saclay we have built the large solid angle (20 msr), broad momentum acceptance (+-18%) and high resolution ($dp/p = 10^{-3}$) magnetic spectrometer SPES II. On its focal plane three large wire chambers allow us to measure the coordinates of the outgoing particle with a precision better than one millimeter. This whole system has been transported to CERN where, in conjunction with the secondary beam line K22, it has been used to investigate the spectroscopy of eleven hypernuclei: sub(Λ)^{6}Li, sub(Λ)^{7}Li, sub(Λ)^{9}Be, sub(Λ)^{12}C, sub(Λ)^{16}O, sub(Λ)^{27}Al, sub(Λ)^{32}S, sub(Λ)^{40}Ca, sub(Λ)^{51}V, sub(Λ)^{89}Y, and sub(Λ)^{209}Bi. For the first time the precise and unambiguous identification of hypernuclear excited states has been possible. This has allowed us to determine the central and the spin-orbit of the Λ-nucleus interaction.

3192 **(CERN-EP—81-137) Hadronic final states in muon interactions.** Montgomery, H.E. (European Organization for Nuclear Research, Geneva (Switzerland)). 3 Nov 1981. 18p. (CONF-810895—20). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83900232.

From International symposium on lepton and photon interactions at high energies; Bonn, F.R. Germany (24 Aug 1981).

Portions of document are illegible.

A review is made of experimental data on the final state hadronic system produced in deep inelastic scattering of muons. The data are compared with earlier results from electron scattering experiments and with the relevant theoretical models.

3193 **(CONF-7910125—8) Experiments on e^+e^- and anti pp colliders.** Barish, B.; Banner, M.; Ellis, J.; Fluegge, G.; Wolf, G.; Orito, S.; Breidenbach, M.; Olive, D.; Ritson, D. (Stanford Univ., CA (USA)). 1979. Contract AC03-76ER00850. 14p. NTIS, PC A02/MF A01. Order Number DE82022252.

From 2. ICFA workshop on possibilities and limitations of accelerators and detectors; Les Diablerets, Switzerland (4 Oct 1979).

We have studied the physics possibilities on two super high energy machines. First, we have investigated e^+e^- at 350 GeV and, second, anti pp at 20 TeV.

3194 **(DESY—81-051) First measurement of the photon structure function F_2.** Berger, C.; Genzel, H.; Grigull, R.; Lackas, W.; Raupach, F.; Wagner, W.; Klovning, A.; Lillestoel, E.; Skard, J.A.; Ackermann, H. (Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany, F.R.)). Aug 1981. 15p. Dep. NTIS (US Sales Only), MF A01. Order Number DE82750217.

Using data taken at PETRA we present results on deep inelastic electron photon scattering at momentum transfers $1 < Q^2 < 15$ GeV^2. The results are expressed in terms of the photon structure function F_2 and are compared with QCD predictions and 'hadronic' models of the photon. The pointlike component of the photon is found to be dominant.

3195 **(DESY—81-054) Energy dependence of event shapes in e^+e^- annihilation at C.M. energies from 7.7 to 31.6 GeV.** Berger, C.; Genzel, H.; Grigull, R.; Lackas, W.; Raupach, F.; Wagner, W.; Klovning, A.; Lillestoel, E.; Skard, J.A.; Ackermann, H. (Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany, F.R.); European Physical Society, Geneva (Switzerland)). Sep 1981. 4p. (CONF-810760—11). Dep. NTIS (US Sales Only), MF A01. Order Number DE82750218.

From International conference on high energy physics; Lisbon, Portugal (9 Jul 1981).

The energy dependence of jet shape measures is studied at centre of mass energies from 7.7 to 31.6 GeV using the magnetic detector PLUTO. The strong coupling constant αsub(s) was determined by a fit to perturbative QCD calculations and phenomenological assumptions on the non perturbative contributions. The result on αsub(s) is compared with an analysis of three jet events at approx. equal to 30 GeV.

3196 **(DESY—81-058) Exclusive proton-antiproton production in two photon collisions.** Brandelik, R.; Braunschweig, W.; Gather, K.; Kirschfink, F.J.; Luebelsmeyer, K.; Martyn, H.U.; Peise, G.; Rimkus, J.; Sander, H.G.; Schmitz, D. (Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany, F.R.)). Sep 1981. 6p. Dep. NTIS (US Sales Only), MF A01. Order Number DE82750219.

Production of proton-antiproton pairs by two photon scattering has been observed at the electron-positron storage ring PETRA. A total of eight proton-antiproton pairs have been identified using the time-of-flight technique. We have measured a total cross section of 4.5 +- 1.6 +- 0.8 nb in the photon-photon c.m. energy range 2.0-2.6 GeV.

3197 **(DESY—81-086) High energy e^+e^- interactions.** Wolf, G. (Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany, F.R.)). Dec 1981. 107p. NTIS (US Sales Only), PC A06/MF A01. Order Number DE82750579.

A review is given about the experimental studies of e^+e^- interactions. After a description of the PETRA and PEP storage rings the structure of leptons and the weak neutral current contributions to lepton pair production are discussed. Then experiments for the search for new particles, the jet formation in e^+e^- annihilation, and the quark and gluon fragmentation are described.

3198 **(DOE/ER/01545—T1-Pt.1) High-energy-physics studies. Progress report, Part I. Experimental program.** (Ohio State Univ., Columbus (USA)). 1982. Contract AC02-76ER01545. 81p. NTIS, PC A05/MF A01. Order Number DE83001126.

Portions of document are illegible.

The experimental high energy physics program at Ohio State University for 1982 is described. The following topics are discussed: a search for neutrino oscillations at LAMPF; measuring charm and beauty decays via hadronic production in a hybrid emulsion spectrometer; prompt neutrino production experiment; search for long-lived particles from neutrino interactions in a tagged emulsion spectrometer; electron-positron interactions at CESR-CLEO; a search for exotic forms of stable matter; and development of computer systems for data processing and for development of detectors. (GHT)

3199 **(DOE/ER/05096—10) High-energy physics. Progress report, March 1, 1982-February 28, 1983.** Phillips, G.C.; Roberts, J.B. (Rice Univ., Houston, TX (USA). Dept. of Physics). 1 Oct 1982. Contract AS05-76ER05096. 64p. NTIS, PC A04/MF A01. Order Number DE83001019.

Portions of document are illegible.

Considerable progress has been made in high-energy physics research on several fronts during the present contract year. Analysis of the data from ZGS polarized beam experiments E-460 and E-462 has continued and is nearing completion. This, along with our data from LAMPF E-504/505, will have considerable bearing on the question of dibaryon resonances. Work has continued on the project to accelerate polarized-proton beams in the Brookhaven AGS. One of our contributions to this project, the 200-MeV polarimeter, will be completed, calibrated, and installed in the AGS LINAC during this contract year. The combined proposal E-704 for the first-round polarized-beam experiment at FNAL was approved and an agreement was reached among the various collaborators and submitted to the laboratory. The first run of the hadron-jet-calorimeter experiment, FNAL E-609, was completed during this contract year. Data analysis is underway which will constitute three Ph.D. theses for Rice students. We have also investigated additional future directions for the program, such as neutrino oscillation studies, high energy e-p collisions, underground detectors, and experiments at LAMPF II.

3200 **(DOE/ER/10402—2) Pion-nucleon partial-wave analysis and study of baryon structure. Final report, June 1, 1981-August 31, 1982.** (Saint Bonaventure Univ., NY (USA)). 31 Aug 1982. Contract AC02-79ER10402. 5p. NTIS, PC A02/MF A01. Order Number DE83000724.

This report outlines the progress made in the past 15 months toward completion of a long-term pion-nucleon partial wave analysis in collaboration with R.E. Cuthosky at Carnegie-Mellon University. The report details other theoretical work done during this time period, including work on the Table of Particle Properties, 1982.

3201 **(DOE/ER/40033—29) Experimental studies of elementary-particle interactions at high energies. Technical progress report.** (Rockefeller Univ., New York (USA)). 1 Oct 1982. Contract AC02-81ER40033. 29p. NTIS, PC A03/MF A01. Order Number DE83001640.

Research on proton-proton collisions and proton-antiproton collisions at the CERN ISR AND SPS facilities is described. Experiments performed at Fermilab accelerator on hadron dissociation and photon dissociation are discussed, and proposed studies at Lawrence Livermore Laboratory on electron neutrino mass are described. (GHT)

3202 **(FERMILAB—81/81-EXP-R) Observation of phi°phi° production in 400-GeV/c proton-proton interactions.** Green, D.R. (Fermi National Accelerator Lab., Batavia, IL (USA)). Dec 1981. Contract AC02-76CH03000. 7p. NTIS, PC A02/MF A01. Order Number DE82022448.

Portions of document are illegible.

Inclusive phi phi production has been observed in p-nucleon interactions at 400 GeV/c. The number of events is larger than expected for uncorrelated phi pairs. There is some excess of correlated events at a mass M/sub phi phi/ near 2110 MeV/c^2.

3203 **(INIS-mf—6989) Low energy pion-^{16}O scattering. An application of the single-hole optical potential.** Wafelbakker, C.K. (Vrije Univ., Amsterdam (Netherlands)). 23 Sep 1981. 114p. NTIS (US Sales Only), PC A06/MF A01. Order Number DE82780750.

Thesis.

In spite of some outward appearances, the modern microscopic theories of the pion-nucleus (πA) interaction are not fundamentally very different from each other. They can all be derived from the same source, multiple-scattering theory. They all treat the first-order optical potential in a comparatively detailed way and in all of them it is necessary to incorporate higher-order effects in general and pion-annihilation in particular phenomenologically. Basically the same physical features can be embodied in all of them. The presentation of the theoretical scheme underlying the present thesis is designed to stress this conceptual unity of current πA theory. In this thesis the methods developed by De Kam to incorporate Pauli- and binding-corrections to the impulse-approximation first-order optical potential for ^{4}He are extended to a more complicated nucleus, ^{16}O, for the first time. In concreto two situations are considered: π^--^{16}O scattering at energies below nucleon-knockout threshold (13.5 MeV) - 7 and 12 MeV - and at energies 40 and 49.7 MeV, above nucleon-knockout threshold but still well within the low-energy region.

3204 **(INIS-mf—7081) Detection of weak neutral currents in inclusive neutrino reactions.** Hasert, F.J. (Technische Hochschule Aachen (Germany, F.R.). Lehrstuhl fuer Experimentalphysik 3B und 3. Physikalisches Inst.). (Technische Hochschule Aachen (Germany, F.R.). Mathematisch-Naturwissenschaftliche Fakultaet). Jan 1981. 119p. (In German). NTIS (US Sales Only), PC A06/MF A01. Order Number DE82780798.

Thesis.

At a neutrino experiment performed at CERN both the first purely leptonic reaction νsub(μ)e^- → νsub(μ)e^- and the inclusive inelastic neutrino-nucleon reaction νsub(μ)N → νsub(μ) hadrons were detected for the first time. The present thesis contains more detailed analysis of the last hadronic reaction in the energy range of several GeV.

3205 **(INIS-mf—7082) Observation of muon-electron pairs in neutrino reactions.** Hoffmann, D. (Technische Hochschule Aachen (Germany, F.R.). Lehrstuhl fuer Experimentalphysik 3B und 3. Physikalisches Inst.). (Technische Hochschule Aachen (Germany, F.R.). Mathematisch-Naturwissenschaftliche Fakultaet). May 1980. 152p. (In German). NTIS (US Sales Only), PC A08/MF A01. Order Number DE82780799.

Thesis.

The present thesis describes the observation of muon-electron pairs in neutrino reactions. This experiment was performed using an optical multiplate spark chamber in the broad band neutrino beam of the CERN proton synchrotron.

3206 **(IPNO-PhN—81-22) ^{6}Li(p,Δ^{++})^{6}He reaction at 1.04 GeV and the Δ-N interaction.** Hennino, T.; Bachelier, D.; Bilianiuk, O.M. (Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire). 1981. 12p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702806.

The ^{6}Li(p,Δ^{++})^{6}He reaction has been studied at 1.04 GeV for transferred momenta ranging from 0.11 to 0.35 (GeV/c)^2. An exponential decrease of the cross-section is observed. A Glauber

type calculation is presented. The possibility of extracting information on σsub(ΔN) and αsub(ΔN) is discussed.

3207 (KEK—80-4, pp 88-96) **Monte Carlo simulation of charged weak current reactions at TRISTAN.** Ochiai, F. (National Lab. for High Energy Physics, Oho, Ibaraki (Japan)). Aug 1980. Dep. NTIS (US Sales Only).

From 4. TRISTAN workshop; Oho, Japan (1 May 1979).

The possibility to measure charged current events with TRISTAN was investigated. The counting rates for electromagnetic and charged current interactions were estimated. The counting rate is sufficient for the charged current events at TRISTAN, and the effect of the intermediate vector meson exchange will be measurable. However, the identification of the charged current events is a difficult task since neutrinos are not detectable. The practical method of this type of experiments was studied by the simulation using the Monte Carlo method. The result showed that hadrons appeared in two well defined jets, one (the current jet) at an angle determined by the scaling variables x and y, the other along the initial proton direction. It is difficult to detect the particles produced along the initial proton direction. It will have big influence to the determination of the neutrino direction and the scaling variables x and y. However, the particles at small angles carry small transverse momentum, and hence they will not much influence the imbalance of transverse momentum. The particles produced at large angles are distributed in a plane coplanar to the direction of the neutrino momentum. Therefore, the momentum of neutrinos can be defined rather well.

3208 (LA—9504-T) **Measurement of the spin-spin correlation parameter C/sub LL/(Θ) in proton-proton scattering.** Stuart, S.J. (Los Alamos National Lab., NM (USA)). Aug 1982. Contract W-7405-ENG-36. 57p. NTIS, PC A04/MF A01. Order Number DE83000462.

Thesis. Submitted to New Mexico State Univ., Las Cruces, NM. Portions of document are illegible.

The experimental procedures and methods of data analysis used to measure the spin-spin correlation parameter C/sub LL/(Θ) in proton-proton scattering at thirteen different energies in the range 300 to 800 MeV are presented. The results compare favorably with previous data. Good agreement is found with phase shift predictions at energies below 500 MeV.

3209 (PITHA—81/33) **Search for axions.** Faissner, H. (Technische Hochschule Aachen (Germany, F.R.). Lehrstuhl fuer Experimentalphysik 3B und 3. Physikalisches Inst.). Nov 1981. 27p. (CONF-810895—19). NTIS (US Sales Only), PC A03/MF A01. Order Number DE83900234.

From International symposium on lepton and photon interactions at high energies; Bonn, F.R. Germany (24 Aug 1981).

Portions of document are illegible.

The experimental evidence for penetrating light particles is reviewed. The first indications for these achions to exist were obtained by Aachen-Padova in the 2 GeV (anti-)neutrino beam of the CERN PS. Then an Aachen group observed fifteen 2γ- and ten 1γ-events, travelling, within the angular resolution, along the beam line from a 590 MeV proton beam dump at SIN. Although the gamma energies were high (≈ 100 MeV), the invariant 2γ mass was unmeasurably small (< 1 MeV). All these events were registered with massive shielding (> 20 X_0) on the beam line in front of the decay region, but 10 X_0 of iron at its end made the effect vanish. Recently 2γ-events have been registered by an Aachen-Juelich group as coincidences between two NaI-counters, near a research reactor of 10 MW. The NaI-crystals were protected by plastic veto-counters, and by several layers of shield. The reactor ON - OFF rate (of some per hour) was proportional to the effective decay volume available. The finite opening angle Θγγ, imposed by different geometries, together with the respective γ-energies measured, yield an invariant mass mγγ = (200 +- 50) keV. All these data are compatible with a classical axion decaying into two photons, N = 3 generations of Fermions, and a Higgs parameter X close to 3. It is suggested that part of the hadronless muon pairs, seen by Aachen-Padova, stem from coherent achion/axion interactions with Al^{27}.

3210 (SLAC-PUB—2943) **Recent results from MARK II at PEP.** Schlatter, D. (Stanford Linear Accelerator Center, CA (USA)). Jun 1982. Contract AC03-76SF00515. 9p. (CONF-8205116—6). NTIS, PC A02/MF A01. Order Number DE82022223.

From 5. international conference on novel results in particle physics; Nashville, TN, USA (24 May 1982).

Portions of document are illegible.

Results on hadronic final states in e^+e^- annihilation are reported. The data were collected with the MARK II detector at the PEP storage ring at the Stanford Linear Accelerator Center, operating at a center-of-mass energy of $\sqrt{s}$ = 20 GeV. The MARK II detector, a 4.5 KG solenoid with cylindrical drift chambers, surrounded by a liquid argon calorimeter, has been described in detail. Hadronic events are selected by applying several cuts. There have to be at least 5 charged particles, each with momentum greater than 100 MeV, in an event. The total visible energy has to be larger than 8 GeV (or 15 Gev in the case of the energy correlation). The vertex position has to coincide with the beam crossing point. The data used for this report correspond to a total integrated luminosity of about 15 pb^{-1} collected in spring 1981.

6452 Particle Interactions And Properties - Theoretical

REFER ALSO TO CITATION(S) 3235, 3266, 3463

3211 (BNL—31782) **Other QCD tests.** Bunce, G. (Brookhaven National Lab., Upton, NY (USA)). 1982. Contract AC02-76CH00016. 18p. (CONF-8206116—4). NTIS, PC A02/MF A01. Order Number DE83000211.

From Workshop on division of particles and fields of the APS; Aspen, CO, USA (28 Jun 1982).

Portions of document are illegible.

There are two testing grounds for strong-interaction theory (call this QCD) which are not usually included in discussions about either present or future QCD tests: inclusive polarization and exclusive reactions.

3212 (BNL—31987) **ISAJET: a Monte Carlo event generator for pp and anti pp interactions. Version 3.** Paige, F.E.; Protopopescu, S.D. (Brookhaven National Lab., Upton, NY (USA)). Sep 1982. Contract AC02-76CH00016. 8p. (CONF-8206120—3). NTIS, PC A02/MF A01. Order Number DE83001305.

From Elementary particle physics and future facilities summer study; Snowmass, CO, USA (1 Jun 1982).

Portions of document are illegible.

ISAJET is a Monte Carlo computer program which simulates pp and anti pp reactions at high energy. It can generate minimum bias events representative of the total inelastic cross section, high PT hadronic events, and Drell-Yan events with a virtual γ, W^{+-}, or Z^0. It is based on perturbative QCD and phenomeno-logical models for jet fragmentation.

3213 (CBPF-NF—006/81) **Heavy quark fusion and recent data on charm muon-production.** Escobar, C.O.; Shellard, R.C.; Malbouisson, A.P.C.; Santoro, A.F.S.; Souza, M.H.G. (Centro Brasileiro de Pesquisas Fisicas, Rio de Janeiro). 1981. 12p. (IFT-P—01/81). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82703153.

The heavy quark fusion mechanism for the hadronic production of QQ bound states is considered in view of the recent results on charm muon-production. Arguments against a contribution of CC fusion to the production of hidden charm are presented.

3214 (CBPF-NF—032/81) **Theoretical and phenomenological problems concerning J(sup P)=1⁺ mesons.** Bediaga, I.; Pires, J.M.; Santoro, A.F.S. (Centro Brasileiro de Pesquisas Fisicas, Rio de Janeiro). 1981. 72p. NTIS (US Sales Only), PC A04/MF A01. Order Number DE82703154.

From both the experimental and theoretical points of view, the researches on J (sup P) = 1^+ mesons have been very important for hadronic physics. The complex problems involving these states (particularly regarding the determination of resonances and other non-resonant effects) have occupied a great part of the hadron-

hadron phenomenology literature in the last decade. A description of the principal views of the subject is given with a particular emphasis on the case of the $A_1(\rightarrow p\pi)$ meson because it is the most important source of papers on J(sup P)=1^+ objects and presents still now, open problems. An almost exhaustive of references on the subject and correlated topic is given.

3215 **(DESY—81-050) Multiple bremsstrahlung in gauge theories at high energies. Pt. 1. General formalism for quantum electrodynamics.** Causmaecker, P. de; Gastmans, R.; Troost, W.; Tai Tsun Wu. (Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany, F.R.)). Aug 1981. 14p. Dep. NTIS (US Sales Only), MF A01. Order Number DE82750221.

Multiple bremsstrahlung is studied on the level of tree diagrams for gauge theories. At high energies and in most of the kinematic region, the fermion mass can be neglected. In this case, it is natural to introduce helicity states for both fermions and gauge particles. Our general formalism is given in detail for quantum electrodynamics. In particular, it is expedient to use photon polarization vectors which depend on the fermion helicities. In this way, extensive cancellations between Feynman diagrams are accomplished automatically.

3216 **(DESY—81-059) QCD effective coupling constant in e^+e^- annihilation.** Ali, A. (Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany, F.R.); International Union of Pure and Applied Physics). Sep 1981. 10p. (CONF-810895—9). Dep. NTIS (US Sales Only), MF A01. Order Number DE82750224.

From International symposium on lepton and photon interactions at high energies; Bonn, F.R. Germany (24 Aug 1981).

The QCD effective coupling constant $\alpha sub(s)(Q^2)$ is determined by comparing the $\sigma(\alpha sub(s))^2$ jet-distributions with the high energy e^+e^- data from PETRA. We get $\alpha sub(s)(Q^2 = 1225\ GeV^2) = 0.125 +- 0.01$, which corresponds to $\Lambda sub(anti\ MS) = 110\ ^{+70}sub(-)_{50}$ MeV with five flavours.

3217 **(DESY—81-060) Phenomenology of the Higgs boson.** Ali, A. (Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany, F.R.); International Union of Pure and Applied Physics). Sep 1981. 22p. (CONF-810759—19). Dep. NTIS (US Sales Only), MF A01. Order Number DE82750222.

From Physics opportunities at ISABELLE summer workshop; Upton, NY, USA (20 Jul 1981).

The phenomenology of the standard Weinberg-Salam Higgs boson is reviewed with particular emphasis on production mechanisms in high energy e^+e^- and hadron-hadron collisions. The production processes relevant for the ISABELLE and TEVATRON energies are discussed and their backgrounds estimated. It is argued that the toponium production and radiative decay provides the most hopeful reaction to detect a Higgs in both the e^+e^- and the hadron-hadron machines.

3218 **(DESY—81-062) Infrared dynamics of quantum electrodynamics and the asymptotic behavior of the electron form factor.** Dahmen, H.D.; Steiner, F.; Scholz, B. (Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany, F.R.)). Sep 1981. 15p. Dep. NTIS (US Sales Only), MF A01. Order Number DE82750223.

A general method is presented for the study of the infrared dynamics in quantum electrodynamics. As an illustrative example the method is applied to the electron form factor. The proof of the famous exponentiation is very simple and needs no order by order investigation of perturbation theory. The correct renormalization of the form factor is automatically obtained. Its asymptotic behavior at large momentum transfer shows the well-known Sudakov suppression in addition to the explicit infrared divergences. The Sudakov behavior is intimately related to the infrared divergent Coulomb phase via an Omnes representation.

3219 **(DESY—81-085) Constraints on recombination functions from J/psi decays.** Jones, L.M. (Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany, F.R.)). Dec 1981. 11p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82750578.

The J/psi $\rightarrow$ 3 gluon decay is combined with current recipes for gluon recombination into hadrons to yield rates for exclusive decays.

3220 **(DESY—81-089) Glueball mass spectrum in QCD: First results of a lattice Monte Carlo calculation.** Ishikawa, K.; Teper, M.; Schierholz, G. (Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany, F.R.)). Dec 1981. 19p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82750577.

We perform a variational calculation of the masses of glueballs of various spins and parities in SU(2) gauge theory. The quantum vacuum we use is generated by the lattice Monte Carlo technique. Our first results, obtained on medium sized lattices, give $m(0^+) = (3.6 +- .35)\Lambda sub(mom)$, $m(0^-) = (6.0 +- 1.0)\Lambda sub(mom)$, $m(2^+) = (6.5 +- sup(1.8)sub(1.1))\Lambda sub(mom)$, various mass upper bounds and information on glueball wave functions.

3221 **(DOE/ER/01545—T1-Pt.2) High-energy-physics studies. Progress report, Part II. Theoretical program.** (Ohio State Univ., Columbus (USA)). 1982. Contract AC02-76ER01545. 23p. NTIS, PC A02/MF A01. Order Number DE83001375.

The main topics of investigation have been the theory, construction, and application of gauge models. The major sub-areas of our research this year are: (1) realization of fermion chiral symmetries, either through massless composite fermions (exact symmetry) or Goldstone bosons (spontaneously broken symmetry); applications to dynamically broken gauge theories; (2) mean field theory approach to solutions of a QCD effective Lagrangian with static quark sources; (3) supersymmetry and grand unified theories; (4) neutrino mixing in grand unified theories; (5) implications of the large N limit; (6) composite models of leptons and quarks; experimental test for quark and lepton substructure; (7) lattice gauge theories; and (8) glueball theory and phenomenology.

3222 **(DOE/ER/03244—99) Searches for a possible strangeness S = -2 dibaryon.** Barnes, P.D. (Carnegie-Mellon Univ., Pittsburgh, PA (USA)). 1982. Contract AC02-76ER03244. 15p. (COO—3244-99; CONF-820745—2). NTIS, PC A02/MF A01. Order Number DE83001040.

From 2. LAMPF workshop; Los Alamos, NM, USA (19 Jul 1982).

Since the advent of QCD there has been a strong interest in manifestations of quark degrees of freedom in medium energy nuclear and particle physics. Within the framework of multiquark states the emphasis has centered on states with more than three quarks bound by colour forces rather than by the conventional mesonic forces. Dibaryon systems have played an important role within that framework. One of the most spectacular and exciting predictions is the possible existence, according to the MIT bag model, of a stable, flavor-singlet, strangeness = $^-2$,J/sup P/ = 0^+ dihyperon, called by R. Jaffe the H particle. It is a six-quark object (2u, 2d, 2s quarks) with a predicted mass around 2150 MeV, i.e., below the $\Lambda\Lambda$ mass with a binding energy around 80 MeV. Its decay channels would be restricted to ΣN and ΛN, via the weak interaction. The relevant two body states are shown. A similar prediction was obtained on the basis of the same model by Mulders et al., with a mass of 2164 MeV for this state. For completeness it should be mentioned that in a recent estimate of the center-of-mass correction to the static MIT bag model, the authors suggest that the dilambda mass moves up to just above the $\Lambda\Lambda$ threshold. These calculations are undergoing further tets. Although all these results come from a specific model, Lipkin has argued that the general features of QCD and the known baryon mass splittings imply that the six-quark state with charge zero, spin zero, and strangeness = $^-2$ would have the greatest binding potential.

3223 (INIS-SU—125, pp 185) **Σ hypernuclei and Σ-N forces.** Kolesnikov, N.N.; Kopylov, V.A.; Prudnoglyad, A.V. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3224 (INIS-SU—125, pp 187) **Cluster hypernuclei.** Kolesnikov, N.N.; Kopylov, V.A.; Kolesov, A.V. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3225 (INIS-SU—125, pp 216) **Energy levels of lambda hyperon in hypernuclei and baryon quark structure.** Filimonov, V.A. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3226 (ITEP—92(1981)) **Calculation of baryon masses in quantum chromodynamics. Errata.** Ioffe, B.L. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Teoreticheskoj i Ehksperimental'noj Fiziki). 1981. 3p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702981.

Some mistakes made in the previous paper are corrected. The account of terms erroneously omitted in the expression for the mean vacuum value of the polarization operator has not affected the main results of the paper. Necessary changes are made with the coefficients for the isobar mass and the nucleon mass. The most important differences arisen in the case of the mass splitting in the baryon octet are removed.

3227 (JINR—E4-82-133) **Pion polarizabilities from backward and fixed-u sum rules.** Fil'kov, L.V.; Guiasu, I.; Radescu, E.E. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics). 1982. 10p. Joint Inst. for Nuclear Research, Dubna, USSR.

Various contributions to the pion polarizabilities are estimated using sum rules obtained from backward and fixed $u = \mu^2$ (μ - pion mass) dispersion relations for the relevant pion Compton scattering amplitude. While the s-channel part can be quite reliably computed in terms of the strong and radiative widths of known meson resonances, the evaluation of the t-channel piece remains highly model dependent despite important clarifications provided recently by measurements of the $\gamma\gamma \to \pi\pi$ reaction.

3228 (KFK—3208) **Investigation of the antiprotonic X-ray spectrum of the lithium isotopes ^{6}Li and ^{7}Li.** Guigas, R. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Kernphysik). Sep 1981. 113p. (In German). Dep. NTIS (US Sales Only), MF A01. Order Number DE82750220.

Antiprotons of the low-energy separated anti p-beam K_{23} at CERN in Geneva have been stopped in thin (0.6 g/cm^2) targets of the Lithium isotopes ^{6}Li and ^{7}Li. The characteristic X-rays of the formed antiprotonic atoms were measured with four identical high-resolution Si (Li) detectors. Three lines of the N- series, four lines of the M-series and the 3d-2p transition of the Balmer series were observed. The measured relative intensities of the M- and N-series transitions are well described by the simple cascade model of Eisenberg and Kessler. The 3d-2p transition is considerably influenced by the strong interaction between antiproton and nucleus and thus drastically reduced in intensity. The analysis of this transition yields the shift and width of the 2p level, whereas the width of the 3d level is deduced from intensity considerations.

3229 (DOE/ER/03244—100) **Weak decay of LAMBDA hypernuclei.** Barnes, P.D.; Grace, R. (Carnegie-Mellon Univ., Pittsburgh, PA (USA). Dept. of Physics). [nd]. Contract AC02-76ER03244. 16p. (CONF-820745—3; COO—3244-100). NTIS, PC A02/MF A01. Order Number DE83001009.

From 2. LAMPF workshop; Los Alamos, NM, USA (19 Jul 1982).

Binding a lambda to a nucleus presents an opportunity to study the four fermion weak interaction. In particular a A bound in the 1s orbit of the nuclear potential can only decay through a strangeness nonconserving weak current. Since the relevant coupling constants are known fairly well and the decay rate can be calculated, it is important to provide the most complete set of experimental data to check the calculations. Because of the competition between mesonic and nonmesonic decay modes of A hypernuclei the experimental situation is somewhat complicated. What is needed is data in (a) very light nuclei where the mesonic mode dominates and (b) somewhat heavier nuclei where the mesonic mode is suppressed so that the nonmesonic mode dominates. The bulk of the existing data is related to hydrogen and helium, which are examples of case (a). We describe an experiment now under construction, which has been designed to provide comparable or better data for the case of ^{12}/sub LAMBDA/C where the nonmesonic decay mode is expected to dominate (case b). We present the detailed motivation of the measurement, together with discussions of recent calculations and relevant data. We also describe the planned experiment and the advantages of LAMPF II for these investigations.

6453 Particle Invariance Principles And Symmetries

3230 (BONN-HE—81-17) **Particle physics prospects: August '81. Closing talk given at the 1981 international symposium on lepton and photon interactions.** Okun, L.B. (Bonn Univ. (Germany, F.R.). Physikalisches Inst.). 1981. 13p. (CONF-810895—10). Dep. NTIS (US Sales Only), MF A01. Order Number DE82750225.

From International symposium on lepton and photon interactions at high energies; Bonn, F.R. Germany (24 Aug 1981).

The author gives a review about symmetry breaking induced by scalar bosons. In this connection he discusses the electroweak symmetry breaking due to the Higgs mechanism, the CP-violation, and technicolor. Finally, he considers the connection between these particles and supersymmetry.

6454 Field Theory

REFER ALSO TO CITATION(S) 3215, 3218

3231 (DESY—81-049) **Disorder parameter that tests for confinement in gauge theories with quark fields.** Mack, G.; Meyer, H. (Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany, F.R.)). Aug 1981. 26p. Dep. NTIS (US Sales Only), MF A01. Order Number DE82750226.

We propose to use a suitably defined vortex free energy as a disorder parameter in gauge field theories with matter fields. It is supposed to distinguish between confinement phase, massless phase(s) and Higgs phase where they exist. The matter fields may transform according to an arbitrary representation of the gauge group. We compute the vortex free energy by series expansion for a Z_6 Higgs model and for SU (2) lattice models with quark or Higgs fields in the fundamental representation at strong coupling (confinement phase), and for the Z_6 Higgs model in the range of validity of low temperature expansions (Higgs phase). The results are in agreement with the expected behaviour.

3232 (DESY—81-052) **Renormalization of FF.** Tarrach, R. (Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany, F.R.)). Aug 1981. 32p. Dep. NTIS (US Sales Only), MF A01. Order Number DE82750227.

A fairly complete study of the renormalization of Fsup(μ)sup(ν)sub(a)Fsub(μ)sub(ν)sub(a) is presented in the gauge in which it is simplest: the background field gauge. This gauge allows one to go to second order perturbation theory without evaluating a single Feynman integral. The use of the equations of motion, the gauge invariance of a classically gauge invariant renormalized operator and the renormalization group invariance are studied. Its two loop anomalous dimension is given and its relation the trace anomaly obtained.

3233 (DESY—81-061) **Local observables in non-Abelian gauge theories.** Sharatchandra, H.S. (Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany, F.R.)). Sep 1981. 21p. Dep. NTIS (US Sales Only), MF A01. Order Number DE82750228.

Labelling of the physical states of a non-Abelian gauge theory on a lattice in terms of local observables in considered. The labelling is in terms of local color electric field observables and (separately) local color magnetic field observables. Matter field is

also included. The non-local variables required when space is multiply-connected, are specified. Non-Abelian version of the Stokes' theorem is considered. Relevance to the continuum theory is discussed in detail.

3234 **(DESY—81-079) Proof of Bander's conjecture concerning ambiguities of magnetic flux.** Mitra, P. (Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany, F.R.)). Nov 1981. 6p. Dep. NTIS (US Sales Only), MF A01. Order Number DE82750649.

For three or more dimensions, we prove Bander's conjecture, which says that 't Hooft's definition of the magnetic flux of an SU(N) gauge system confined to a box with periodic boundary conditions gives a unique result for almost all configurations.

3235 **(DESY—82-001) Physical state space of quantum electrodynamics.** Buchholz, D. (Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany, F.R.)). Jan 1982. 38p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE82750576.

Starting from the fact that electrically charged particles are massive we derive a criterion which characterizes the state space of quantum electrodynamics. This criterion clarifies the special role of the electric charge amongst the uncountably many superselection rules in quantum electrodynamics and provides a basis for a general analysis of the infrared problem. Within this framework we establish the existence of asymptotic electromagnetic fields in all charge-sectors, find a general characterization of infraparticles and introduce a notion of asymptotic completeness.

3236 **(IPNO-TH—81-36) Unification of boson expansion theories. (III) Applications.** Dobaczewski, J. (Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire). Oct 1981. 49p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE82702797.

A general scheme of constructing boson expansions that was proposed in earlier work is applied to a number or examples. The Fukutome expansion is obtained by considering the spinor representation of the SO(2N+1) group. Its hermitian, Holstein-Primakofr-type version is also derived. The generalized Dyson expansions for even and odd fermion systems are given in terms of two spinor representations of the SO(2N) group. For fixed fermion number systems the relevant boson expansions are obtained by considering the fundamental representations of SU(N) while for fixed seniority those of Sp(N) are concerned. The collective boson expansions corresponding to the Ginocchio model, the interacting boson model of Arima and Iachello and the Elliot model are given for the symmetric representations of SO(8) and SU(1+1) and any representation of SU(3).

3237 **(ITEP—9(1982)) SUSY GUT's.** Vysotsky, M.I. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Teoreticheskoj i Ehksperimental'noj Fiziki). 1982. 10p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702980.

Supersymmetric version of the standard SU(3)xSU(2)xU(1) model is constructed. Low energy (< or approximately 1 TeV) Higgs sector together with two SU(2) doublets H and H' necessarily contain neutral singlet G. Eayet-Iliopoulos D-term induce supersymmetry (SUSY) breaking. Unification into SUSY SU(5) occurs at high energy. Operators with d=5 do not lead to fast proton decay because of the absence of Majorana mass term lambdasub(H')xepsilonlambdasub(H) at the minimum of the low energy Higgs potential. Operators with d=6 lead to proton decay with tausub(p) approximately 10sup(34) years. A variety of new particles and interactions appears at energies approximately 100 GeV in this model (this is typical for models with low energy SUSY).

3238 **(ITEP—19(1982)) Field theories with no local conservation of the electric charge.** Schwarz, A.S. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Teoreticheskoj i Ehksperimental'noj Fiziki). 1982. 32p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE82702979.

The gauge theories with a simply connected gauge group and a disconnected subgroup of unbroken symmetries are studied. It is shown that strings exist in such theories. In some cases a particle changes the sign of its electric charge when it moves around the string.

3239 **(ITP—81-8-E) Quantization of closed systems with a boundary.** Sinyukov, Yu.M. (AN Ukrainskoj SSR, Kiev. Inst. Teoreticheskoj Fiziki). 1981. 24p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702982.

Study is made of the emission effects in quantum-field systems with nonstationary boundary. The back reaction of emission on the boundary is taken into account. The classical equations of motion of a closed system consisting of a free massless scalar field limited in space by a massive reflecting boundary (mirror) are investigated in the two-dimensional case. This system is quantized. Some new physical effects concerned with hadron physics and astrophysics are obtained.

3240 **(JINR—E-2-81-777) Three-loop beta-function in the N-1,2,4, supersymmetric Yang-Mills theories.** Avdeev, L.V.; Tarasov, O.V. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics). 1981. 4p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702983.

Results of the renormalization group beta-function calculations in the N=1,2,4 supersymmetric Yang-Mills theories are presented. In the N=2 theory the two- and three-loop coefficients are found to be zero. For N=4 all the three coefficients vanish as it was shown earlier.

3241 **(JINR—E-2-81-824) Sigma-model formulation of the Yang-Mills theory on four-dimensional hypersphere. Geodesics as paths.** Ivanov, E.A.; Krivonos, S.O. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics). 1981. 15p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702985.

The bilocal sigma-model representation is constructed for the Yang-Mills theory in the simplest conformally flat hyperspherical spaces So(1,4)/SO(1,3), SO(2,3)/SO(1,3) and SO(5)/SO(4). Like in the case of Minkowski and Euclidean spaces, Yang-Mills potential is defined as bsub(μ)(x)=dsub(μ)sup(y)b(x,y)'y=0 , b(x,y) being a bilocal Goldstone field which takes values in the gauge group algebra and is subjected to certain covariant constraints. The minimal version of these constraints results in the "string" representation for b(x,y) through the P-exponential of bsub(μ)(x) along the fixed paths coinciding with geodesics. Due to the presence of closed geodesics, the contour fuctionals naturally appear in the theory, with contours being the circles with the hypersphere radius. The sigma-model representation is shown to be Weyl-covariant: its formulations indifferent conformally flat spaces are related by transformations of ysup(rho). The geometric meaning of ysup(rho) and minimal constraints is explained, and the conformal group gransformation for ysup(rho) is found.

3242 **(JINR—E-2-81-854) Geometries inherent to N=1 supergravities.** Galperin, A.S.; Ogievetsky, V.I.; Sokatchev, E.S. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics). 1981. 19p. (CONF-8110227—1). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702986.

From 11. international seminar on quantum gravity; Moscow, USSR (13 Oct 1981).

The first part of the talk is devoted to a consideration of linearized N=1 supergravities. The second main part deals with complex geometries inherent to different N=1 supergravities. A special attention is paid to a new version with local symmetry. It is connected to the special nonminimal case (n=0) having a remarkable property of supervolume preservation in Csup(4.4) superspace. Therefore the superdeterminant of change of variables from left to right-handed Rsup(4.4) parametrization is a dimensionless scalar. This geometric invariant has to be constrained to obtain an action. Solving such a constraint on vector and spinor prepotentials in Wess-Zumino gauge one obtains the new supergravity with 12+12 fields and local symmetry. A possible relaxation of this constraint is briefly considered (16+16 fields version).

3243 **(JINR—P5-82-246) Existence of positively-defined particle-like solution of nonlinear differential equation psi⁴-Bpsi⁶ theory.** Amirkhanov, I.V.; Zhidkov, E.P. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Computing Techniques and Automation). 1982. 21p. (In Russian). Joint Institute for Nuclear Research, Dubna, USSR.

The nonlinear equation: $d^2/dx^2\ psi(x) - (l(l+1)/x^2 + 1)\ psi(x) [4\ psi^2(x)/x^2 - 3eta\ psi^4(x)/x^4]$, eta > 0, for boundary conditions psi(0) = psi(∞) = 0, was investigated with arbitrary integer value of l. By means of variational approach the existence of positively-defined particle-like solution of the boundary value problem is proved.

3244 **(JINR—P5-82-395) Covariance of the Bogolyubov equation for the generating functional for equilibrium classical systems.** Nazin, G.I. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics). 1982. 14p. (In Russian). Joint Institute for Nuclear Research, Dubna, USSR.

The change of the independent functional variable in the Bogolyubov equation for the generating functional is described in terms of operators acting in the space of absolutely integrable functions. The subclass of such operators which do not change the form of the Bogolyubov equations is characterized by a system of equations. For lattice systems, this subclass is constructively described.

3245 **(JINR—R-2-81-749) Parastatistics and gauge symmetries.** Govorkov, A.B. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics). 1981. 14p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702987.

It is shown that the copy of the only SO(3) - gauge Yang-Mills Lagrangian can be constructed in the Green parafield theory. Thus, the Greenberg paraquarks are not equivalent to coloured quarks obeying SU(3)sub(c). Peculiarities of gauge SO(3) are considered and its possible application as the exact subgroup of the broken SU(3)sub(c) is indicated.

3246 **(LA-UR—82-2562) Is fractional electric charge problematic for QCD.** Slansky, R. (Los Alamos National Lab., NM (USA)). 1982. Contract W-7405-ENG-36. 10p. (CONF-8205116—5). NTIS, PC A02/MF A01. Order Number DE83000352.

From 5. international conference on novel results in particle physics; Nashville, TN, USA (24 May 1982).

A model of broken QCD is described here; SU_3/sup c/ is broken to SO_3/sup g/ (g for glow) such that color triplets become glow triplets. With this breaking pattern, there should exist low-mass, fractionally-charged diquark states that are not strongly bound to nuclei, but are rarely produced at present accelerator facilities. The breaking of QCD can be done with a 27/sup c/, in which case, this strong interaction theory is easily embedded in unified models such as those based on SU_5, SO_{10}, or E_6.

3247 **(NBI-HE—82-17) Classical Yang-Mills equations with weak external sources.** Arodz, H. (Niels Bohr Inst., Copenhagen (Denmark)). May 1982. 14p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702988.

A method proposed by Jackiw, Jacobs and Rebbi for solving classical Yang-Mills equations with external color charges by an expansion of solution in powers of the external color charge is applied in order to find gauge potentials generated by the external color charge with Hopf index +-1. This topologically non-trivial charge turns out to support non-Abelian Coulomb type solution. A gauge invariant expression for energy in the presence of external currents is also proposed.

3248 **(NBI-HE—82-18) Variational study of critical properties: the spectrum and phase structure of the XY-model.** Hari Dass, N.D.; Patkos, A. (Niels Bohr Inst., Copenhagen (Denmark)). May 1982. 29p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE82702989.

The wave functionals for the excited states of the two dimensional planar rotator model are constructed approximately with the help of analytical Ansaetze. The mass gap so calculated is found to be in quantitative agreement with theoretical expectations for any T > Tsub(c). The order-disorder type transition line of the generalized model with Ising type symmetry breaking term is obtained using a similar Ansatz.

3249 **(NBI-HE—82-20) Phase structure of variant action lattice gauge theory by mean field theory with corrections.** Alberty, J.M.; Lautrup, B.; Flyvbjerg, H. (Niels Bohr Inst., Copenhagen (Denmark)). May 1982. 18p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702990.

Mean field theory with one-loop corrections is used to study the phase structure of SU(2) lattice gauge theory with a variant action. In 4 dimensions the phase diagram found by Bhanot and Creutz by Monte Carlo methods is reproduced, including the triple point and the end point of a line of first order transitions. The phase diagram in 5 dimensions is predicted with less than 8 per cent error. The role of Z(2)-fluxons in phase transition is elucidated.

65 PHYSICS RESEARCH

6510 Nuclear Physics

REFER ALSO TO CITATION(S) 1830, 2769, 2770, 2771, 2808

3250 **(CONF-820942—18) Major questions about derivation of variance-covariance information for nuclear data evaluations.** Peelle, R.W. (Oak Ridge National Lab., TN (USA)). 1982. Contract W-7405-ENG-26. 12p. NTIS, PC A02/MF A01. Order Number DE82022333.

From Nuclear data for science and technology international conference; Antwerp, Belgium (6 Sep 1982).

The uncertainties in and correlations among some evaluated nuclear data are now evaluated to permit estimation of data-related uncertainties in the outputs of neutronic calculations and to focus data improvement efforts. Questions are discussed that arise in trying to obtain adequate numerical files of variance-covariance uncertainty information. These involve (1) discrepant data, (2) experimental data with incompletely reported uncertainties, (3) uncertainties in nuclear model results, (4) uncertainty data for the resonance regions and for angle and energy distributions, and (5) the role of integral data in nuclear data evaluation. The question also arises whether files of uncertainty data designed for technological applications can suffice to represent past knowledge in an evaluation that includes new data. Directions are indicated toward resolving these questions.

3251 **(DOE/ER/02706—8) Nuclear-structure studies with medium-energy probes. Annual progress report, August 1981-August 1982.** Seth, K.K. (Northwestern Univ., Evanston, IL (USA). Dept. of Physics). 1982. Contract AC02-76ER02706. 44p. NTIS, PC A03/MF A01. Order Number DE83001013.

Portions of document are illegible.

Progress is reported on the following studies: pion induced reactions, proton induced reactions, and electron induced reactions. Pion induced reaction studies include double charge exchange and elastic and inelastic scattering. Proton reaction studies include pion production reactions, p Vector + p → d + π^+, p Vector + p Vector → d + π^+, p Vector + d → t + π^+, d (p Vector, π^+) d^*, and proton elastic and inelastic scattering. Electron scattering from ^{40}Ca and ^{26}Mg are under study. Lists of publications and papers are included. (WHK)

3252 **(DOE/ER/03924—T1) Progress in research, April 1, 1978-March 31, 1979.** (Texas A and M Univ., College Station (USA). Cyclotron Inst.). Jun 1979. Contract AS05-76ER03924. 145p. NTIS, PC A07/MF A01. Order Number DE83000707.

Portions of document are illegible.

Research and development activities are described in the following areas: nuclear reactions and scattering, nuclear structure, polarization studies, interdisciplinary nuclear science, and instrumentation and systems development. Lists of papers, tables, and publications are included. (WHK)

3253 **(DOE/ER/04322—T3) Progress in research, April 1, 1979-March 31, 1980.** (Texas A and M Univ., College Station (USA). Cyclotron Inst.). Jun 1980. Contract AS05-76ER04322. 127p. NTIS, PC A07/MF A01. Order Number DE82021282.

Portions of document are illegible.

Research and development activities are described in the following areas: nuclear structure, nuclear reactions and scattering, polarization studies, interdisciplinary nuclear science, and instrumentation and systems developments. Lists of publications and talks are included. (WHK)

3254 **(HMI—356) Annual report 1980.** (Hahn-Meitner-Institut fuer Kernforschung Berlin G.m.b.H. (Germany, F.R.)). 1981. 129p. (In German). Dep. NTIS (US Sales Only), MF A01. Order Number DE82750638.

This annual report contains a description of the named institute, the research programm, reports from the scientific establishments, a description of different cooperations, and a list of scientific publications.

3255 (INIS-SU—125, pp 470) **Automation of the experiments on neutron-capture gamma resonance scattering.** Gladyshev, D.A.; Kasatov, V.L.; Li, B.N.; Kobilov, O.Sh. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3256 **(INIS-SU—125) Summaries of reports of 32. Conference on nuclear spectroscopy and nuclear structure.** 1982. vp. (CONF-820391—Summ.). NTIS (US Sales Only), PC A25/MF A01. Order Number DE83780083.

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Papers presented were entered into the data base separately. (WHK)

3257 **(KFK—3280) Annual report on nuclear physics activities.** Beck, R.; Bueche, G.; Fluegge, G. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Angewandte Kernphysik 1; Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Kernphysik). Feb 1982. 265p. Dep. NTIS (US Sales Only), MF A01. Order Number DE82750653.

This report surveys the activities in fundamental research from July 1, 1980 to June 30, 1981 at the three institutes of the KfK which are concerned with nuclear physics. The research program comprises laser spectroscopy, nuclear reactions with light ions and physics at medium and higher energies.

3258 **(LBL—13366) Nuclear science. Annual report, July 1, 1980-June 30, 1981.** Friedlander, E.M. (ed.). (Lawrence Berkeley Lab., CA (USA)). Jun 1982. Contract AC03-76SF00098. 300p. NTIS, PC A13/MF A01. Order Number DE83000879.

Portions of document are illegible.

This annual report describes the scientific research carried out within the Nuclear Science Division between July 1, 1980 and June 30, 1981. The principal activity of the division continues to be the experimental and theoretical investigation of the interaction of heavy ions with target nuclei. Complementary research programs in light-ion nuclear science, in nuclear data evaluations, and in the development of advanced instrumentation are also carried out.

3259 (INIS-mf—7221, pp 88) **Relativistic nuclear physics.** Tucek, J. (Ceskoslovenska Akademie Ved, Rez. Ustav Jaderne Fyziky). [nd]. (In Czech). Dep. NTIS (US Sales Only).

From 6. conference of Czechoslovak physicists; Ostrava, Czechoslovakia (27 Aug 1979).

The current state of development is discussed of relativistic nuclear physics. Major laboratories are listed where heavy element nuclei can be accelerated to high energies. The contribution is indicated of experimental and theoretical studies in relativistic nuclear physics to the understanding of the microcosmos. Attention is paid to conclusions from the studies of primary cosmic radiation interactions and to some new typical results of experiments conducted on relativistic ion accelerators, especially to nuclear fragmentation and the study of cumulative effects. The possibilities are outlined of using accelerated relativistic ions in therapy and diagnosis by radiography of biological tissues. (S.P.).

6511 Experimental Techniques

REFER ALSO TO CITATION(S) 2850

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From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

6512 Nuclear Properties And Reactions, A=1-5

REFER ALSO TO CITATION(S) 2807

3261 **(DOE/ER/04043—42) Experiments on the nuclear interactions of pions. Progress report.** Minehart, R.C.; Ziock, K.O.H. (Virginia Univ., Charlottesville (USA). Dept. of Physics). Aug 1982. Contract AS05-76ER04043. 35p. (ORO—4043-42). NTIS, PC A03/MF A01. Order Number DE83000112.

Portions of document are illegible.

Progress is reported on the following projects: (1) quasi-free scattering of pions from ^{3}He and ^{4}He at 200 and 295 MeV; (2) elastic and quasi-free scattering of π/sup +-/ from ^{3}He and ^{4}He at energies above the 3-3 resonance; (3) $\pi^+ + D \rightarrow 2p$; (4) pion double charge exchange; (5) ^{3} ^{4}He (π^-,n) ^{2} ^{3}He and ^{4}He (π^-,π^0) ^{3}H at 285-575 MeV; (6) search for massive neutrinos as an admixture to $\pi^-\mu$ decay; (7) quasi-free pion scattering; (8) measurement of the π^--π^0 mass difference; and (9) search for fractionally charged particles. (WHK)

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From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

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From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

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3267 (INIS-SU—125, pp 303) **Structure of a single spectrum of the D(p,p)np as a result of superposition of D(p,2p)n reaction spectra.** Kadushkin, V.N.; Kiseleva, Z.P.; Radyuk, G.A.; Skorodumov, B.G.; Trinkin, I.I. 1982. (In Russian). Dep. NTIS (US Sales Only).

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3274 (INIS-SU—125, pp 448) **Convergence of the perturbation theory for the resonance states and calculation of the decaying states of the ^{5}Li-^{5}He nuclei.** Emel'yanov, V.G.; Kukulin, V.I.; Klimov, V.I.; Pomerantsev, V.N. 1982. (In Russian). Dep. NTIS (US Sales Only).

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3276 (KFK—3226) **Study of the reaction πp3 He → pnn with stopped pions in a kinematically complete experiment.** Gotta, D. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Kernphysik; Karlsruhe Univ. (TH) (Germany, F.R.). Fakultaet fuer Physik). Oct 1981. 150p. (In German). Dep. NTIS (US Sales Only), MF A01. Order Number DE82750229.

The reaction π^- ^{3}He → pnn with stopped pions has been studied for the first time in a kinematically complete experiment. The measurement was performed at the π E1-channel of the Schweizerische Institut fuer Nuklearforschung (SIN) in Villingen. The data are presented in a Dalitzplot, where the phase-space-factor is constant and so the event density is directly proportional to the reaction matrix element. Within the final state pnn 4 different reactions have been observed: The pure quasifree absorption of the pion either on a proton-neutron- (75.6 +- 12.0%) or the proton-proton-pair (7.5 +- 0.4%) of the ^{3}He-nucleus and the final state interaction of an ejected proton-neutron- (14.9 +- 1.0%) or neutron-neutron-pair (2.0 +- 4%). The reaction π^-^{3}He → dn was registered simultaneously with the process π^-^{3}He → pnn. The branching ratio has been determined to be pnn/dn = 7.7sup(+2.2)sub(-1.4). The large amount of pure quasifree absorption confirms the importance of the 2-nucleon-mechanism for pion absorption in ^{3}He. The influence of the third nucleon is seen in the final state interaction of a part of the ejected nucleons.

3277 (LA—9505-T) **Measurement of the spin-dependent parameter D, R, A, and P, and analyzing power for vector p-d elastic scattering at 500 and 800 MeV.** Rahbar, A.A. (Los Alamos National Lab., NM (USA)). Sep 1982. Contract W-7405-ENG-36. 205p. NTIS, PC A10/MF A01. Order Number DE83002347.

Thesis. Submitted to Univ. of California, Los Angeles.

A specific set of spin dependent parameters for elastic scattering of polarized protons from an unpolarized deuterium target have been measured over the angular range of 15° and 65° in the Laboratory system. The experiment was performed at the Los Alamos Meson Physics Facility (LAMPF) using a polarized proton beam of 0.5 and 0.8 GeV incident kinetic energy. A carbon analyzer was used to measure the scattered proton polarization. This comprises the first set of measurements in the intermediate energy range. Of particular interest, the analyzing power, (A/sub y/), has been measured for the pd elastic scattering reaction at both energies. A test of Time-Reversal Invariance (TRI) has been made for this reaction. This was accomplished by comparing the polarization (P) with the analyzing power A/sub y/ together with the depolarization parameter, (D), which was measured in this experiment. No evidence of time-reversal violation was found for this reaction in the region of non-zero spin flip probability. The measurements also furnished very useful and selective information on the p-d collision matrix, as well as the double-spin-flip nucleon-nucleon amplitudes.

3278 (LA-UR—82-2644) **Charged-particle elastic cross sections.** Hale, G.M.; Dodder, D.C.; DeVeaus, J.C. (Los Alamos National Lab., NM (USA); Illinois Univ., Urbana (USA)). 1982. Contract W-7405-ENG-36. 6p. (CONF-820942—19). NTIS, PC A02/MF A01. Order Number DE83000663.

From Nuclear data for science and technology international conference; Antwerp, Belgium (6 Sep 1982).

Modern treatments of energy loss in plasmas through elastic scattering of energetic ions require complete knowledge of charged-particle elastic cross sections. R-matrix theory provides an explicit separation of nuclear and Coulomb effects in these cross sections, and gives reasonable extrapolations to small angles and low energies, where data may be scarce. We outline the calculation of charged-particle elastic cross sections from R-matrix parameters, and given examples for d-T, d-α, and t-α scattering, obtained from comprehensive analyses of reactions in the ^{5}He, ^{6}Li, and ^{7}Li compound systems. Expansion coefficients for an exact polynomial representation for the difference of the scattering and Rutherford cross sections (σ/sub NI/) are given for d-T scattering. Integral quantities involving σ/sub NI/ calculated from the present cross sections disagree substantially in some cases near resonances with a recent Livermore evaluation.

3279 (LA-UR—82-3076) **Three-body forces.** Friar, J.L. (Los Alamos National Lab., NM (USA)). 1982. Contract W-7405-ENG-36. 12p. (CONF-821050—1). NTIS, PC A02/MF A01. Order Number DE83001988.

From Cyclotron facility workshop; Bloomington, IN, USA (27 Oct 1982).

Portions of document are illegible.

Three-body forces are defined and their properties discussed. Evidence for such forces in the trinucleon bound states and scattering reactions is reviewed. The binding energy defects of the trinucleon bound states, the ^{3}He charge density, the Phillips line for doublet n-d scattering lengths, and three-nucleon breakup reactions

are discussed, together with the possible influence of three-body forces on these observables.

6513 Nuclear Properties And Reactions, A=6-19

REFER ALSO TO CITATION(S) 3190, 3263, 3312

3280 (INIS-mf—6819, pp 669) **Two models for analyzing the form of Doppler-broadened gamma lines.** Abdel-Khadi, M.M.; Kish, A.; Koltai, E.; N'yako, B.; Sabo, D. 1981. (In Russian). NTIS (US Sales Only), PC A99/MF A01.

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

3281 (INIS-mf—7012) **Study of the triton transfer in the sd-shell using (p,α)-reactions on the nuclei ^{20}Ne, ^{24}Mg, and ^{26}Mg.** Rohwer, T. (Tuebingen Univ. (Germany, F.R.). Fakultaet fuer Physik). 10 Jul 1980. 84p. (In German). NTIS (US Sales Only), PC A05/MF A01. Order Number DE82780753.

Thesis.

(p,α) reactions on the target nuclei ^{20}Ne, ^{24}Mg, and ^{26}Mg in the energy range between 22.5MeV and 45 MeV to different final states were studied. The comparison of the measured angular distributions with finite-range DWBA calculations in the cluster-approximation shows that an optimal reconstruction of the measured angular distributions is possible with similar potential parameters for the optical α-potential, which were already successfully applied to earlier performed analyses of the reactions ^{11}B(p,α) and ^{19}F(p,α), while the potential data obtained from scattering experiments could not be applied. The measured strengths for the single transitions are comparable both to the experimental strengths for the one-particle transfer and to the results from shell-model calculations.

3282 (INIS-SU—125, pp 157) **Correlations between calculated properties of the ^{16}O and ^{2}H nuclei.** Gorbatov, A.M.; Krylov, Yu.N.; Rugyak, B.V. 1982. (In Russian). Dep. NTIS (US Sales Only).

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3298 (INIS-SU—125, pp 394) **Microscopic description of the ^{7}Li(p, n)^{7}Be reaction with account for exchange knock out.** Gulyamov, M.G.; Kim, G.; Bekbaev, S.M. 1982. (In Russian). Dep. NTIS (US Sales Only).

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3309 (IPNO-PhN—81-20) **Excited states of ^{19}N and ^{21}O.** Naulin, F.; Detraz, C.; Roy-Stephan, M. (Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire). 1981. 9p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702805.

(^{18}O,^{19}N) and (^{18}O,^{21}O) nuclear reactions on a ^{18}O target provide measurements of excited state energies at 1.12 and 1.59 MeV for ^{19}N and at 1.35 and 3.00 MeV for ^{21}O. The ^{19}N mass is remeasured as 15.856+-0.050 MeV.

6514 Nuclear Properties And Reactions, A=20-38

REFER ALSO TO CITATION(S) 3281, 3283, 3284, 3292, 3295

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3313 (INIS-SU—125, pp 364) **Reaction of incomplete fusion with escape of high energy light particles.** Naumov, Yu.V. 1982. (In Russian). Dep. NTIS (US Sales Only).

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3320 (Juel-Conf—45, pp 313-331) **Differential production cross sections for charged particles produced by 590 MeV proton bombardment of thin metal targets.** Howe, S.D.; Cierjacks, S.; Hino, Y.; Raupp, F.; Rainbow, M.T.; Swinhoe, M.T.; Buth, L. Oct 1981. NTIS (US Sales Only), PC A99/MF A01.

From 5. meeting of the international collaboration on advanced neutron sources; Julich, F.R. Germany (22 Jun 1981).

Differential production cross sections have been measured for the reactions (p,p), (p,d), (p,t) and (p,π+-) using the 590 MeV proton beam at SIN. Here we report measurements made on thin targets of aluminium, niobium, lead, and uranium at laboratory angles of 90° and 157°. The data were taken over a proton energy range of about 50 MeV to 590 MeV. Differential cross sections are reported along with predictions by the intranuclear-cascade/evaporation model as computed by HETC.

3321 (LBL—14864) **Two-pion correlations in heavy ion collisions.** Zajc, W.A. (Lawrence Berkeley Lab., CA (USA)). Aug 1982. Contract AC03-76SF00098. 170p. NTIS, PC A08/MF A01. Order Number DE83000519.

Thesis.

An application of intensity interferometry to relativistic heavy ion collisions is reported. Specifically, the correlation between two like-charged pions is used to study the reactions Ar+KCl→2π/sup +-/+X and Ne+NaF→2π^-+X. Source sizes are obtained that are consistent with a simple geometric interpretation. Lifetimes are less well determined but are indicative of a faster pion production process than predicted by Monte Carlo cascade calculations. There appears to be a substantial coherent component of the pion source, although measurement is complicated by the presence of final state interactions. Additionally, the generation of spectra of uncorrelated events is discussed. In particular, the influence of the correlation function on the background spectrum is analyzed, and a prescription for removal of this influence is given. A formulation to describe the statistical errors in the background is also presented. Finally, drawing from the available literature, a self-contained introduction to Bose-Einstein correlations and the Hanbury-Brown - Twiss effect is provided, with an emphasis on points of contact between classical and quantum mechanical descriptions.

3322 (ZfK—459, pp 169-171) **Evaluation of γ-production cross sections of neutron-induced reactions in Si.** Hermsdorf, D.; Paffrath, E. (Technische Univ., Dresden (German Democratic Republic). Sektion Physik). Sep 1981. NTIS (US Sales Only), PC A10/MF A01.

From 10. international symposium on selected topics of the interaction of fast neutrons and heavy ions with atomic nuclei; Gaussig, F.R. Germany (17 Nov 1980).

The paper reports on the calculation of γ-ray emission spectra and production cross sections resulting from neutron-induced reactions on all stable isotopes of Si by use of different theoretical methods of the γ-de-excitation of highly-excited nuclei. The intercomparison of theoretical and experimental data confirms the reliability of the γ-cascade-formalism included in the code STAPRE to predict unknown cross sections.

3323 (ZfK—459, pp 158-163) **Investigation of ^{28}Si(n,α)^{25}Mg in terms of statistical and direct reaction mechanisms.** Hermsdorf, D. (Technische Univ., Dresden (German Democratic Republic). Sektion Physik). Sep 1981. NTIS (US Sales Only), PC A10/MF A01.

From 10. international symposium on selected topics of the interaction of fast neutrons and heavy ions with atomic nuclei; Gaussig, F.R. Germany (17 Nov 1980).

A reasonable and consistent interpretation of the experimental data available for neutron-induced α-particle-emission can only be achieved by taking into account direct reaction contributions. Using a direct ^{3}He-pick-up mode, spectroscopic factors for the lowest lying discrete levels of ^{25}Mg could be deduced.

3324 (ZfK—459, pp 164-168) **Excitation of the ground state band and the 3^+ non-normal parity state in 28-Si by neutron inelastic scattering at incident energies between 6.8 and 14.8 MeV.** Schmidt, D.; Seeliger, D.; Streil, T. (Technische Univ., Dresden (German Democratic Republic). Sektion Physik). Sep 1981. NTIS (US Sales Only), PC A10/MF A01.

From 10. international symposium on selected topics of the interaction of fast neutrons and heavy ions with atomic nuclei; Gaussig, F.R. Germany (17 Nov 1980).

Angular distributions to the 2_1^+, 4_1^+ and 3_1^+ levels in the ^{28}Si(n,n') reaction had been measured at incident energies 6.8, 7, 8, 9, 10, 11, 12 and 14.8 MeV and have been analyzed. The best description of the ground state band in the frame of the collective model is obtained usind a prolate quadrupole deformation with a negative hexadecapole component. The coupling between the 2_1^+ and 4_1^+ level can be neglected. The excitation of the 3^+ state can be understood as a spin-flip process by coupling to the ground state band.

6515 Nuclear Properties And Reactions, A=39-58

REFER ALSO TO CITATION(S) 2809, 3283, 3284, 3295, 3306, 3310, 3312

3325 (BNL-NCS—31877) **Optical-model calculations for the chromium, iron, and nickel isotopes in the energy range of 0.5 to 100.0 MeV.** Prince, A. (Brookhaven National Lab., Upton, NY (USA)). 1982. Contract AC02-76CH00016. 7p. (CONF-820942—15). NTIS, PC A02/MF A01. Order Number DE83000711.

From Nuclear data for science and technology international conference; Antwerp, Belgium (6 Sep 1982).

Portions of document are illegible.

Optical model (O.M.) calculations have been carried out for the Cr, Fe and Ni isotopes at energies just above the resolved resonance region (0.5 to 0.7 MeV) to the high energy (100.0 MeV) region. A consistent set of O.M. parameters that covered this region produced in addition to the S- and P-wave strength functions the total elastic and differential angular distributions that was in very good agreement with the experimental data. Reproduction of the broad maxima and minima (Nuclear Ramsauer Effect) in addition to S_0, S_1 and R were the established constraints for this analysis.

3326 (INIS-SU—125, pp 176) **Excitation of the ^{58}Ni anomalous parity states in the electron inelastic scattering.** Vdovin, A.I.; Ponomarev, V.Yu.; Stoyanov, Ch. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3327 (INIS-SU—125, pp 209) **Collective states of the ^{43}Ti and ^{43}Ca mirror nuclei.** Okhrimenko, I.P.; Steshenko, A.I. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3328 (INIS-SU—125, pp 270) **Alpha decay of the E2 giant resonance in Ni isotopes.** Kadmenskij, S.G.; Markushev, V.P.; Furman, V.I. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3329 (INIS-SU—125, pp 313) **Analysis of the spin flip probability and elastic and inelastic scattering cross sections of 6.9 MeV protons on the sup(52,54)Cr nuclei.** Chernievskij, V.K.; Prokopenko, V.S.; Rudchik, A.T.; Korbetskij, E.V. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3330 (INIS-SU—125, pp 376) **Thermal neutron acceleration by the sup(180m)Hf and sup(58m)Co isomeric nuclei.** Kondurov, I.A.; Korotkikh, E.M.; Petrov, Yu.V.; Shulyak, G.I. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3331 (INIS-SU—125, pp 415) **Analysis of partial gamma widths of resonance states from the ^{60}Ni(p, γ)^{61}Cu reaction.** Knat'ko, V.A.; Martsynkevich, B.A.; Shimanovich, E.A. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3332 (INIS-SU—125, pp 432) **Elastic and inelastic scattering of light ions by atomic nuclei in intermediate energy range.** Berezhnoj, Yu.A.; Pilipenko, V.V. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3333 (INIS-SU—125, pp 52) **sup(40, 42)K low states.** Rozantsev, I.N. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3334 (INIS-SU—125, pp 54) **Resonance excitation of nuclear levels of some elements by means of the Mn(n, γ) reactions.** Begzhanov, R.B.; Akhrarov, S.M.; Kobilov, O.Sh.; Kulabdullaev, G.A. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3335 (INIS-SU—125, pp 55) **^{45}Sc level lifetimes measured by the DSA method with two targets in the (n, n'γ) reaction on the reactor fast neutrons.** Elenkov, D.V.; Lefterov, D.P.; Tumbev, G.Kh. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3336 (INIS-SU—125, pp 56) **sup(58, 60)Ni level lifetimes measured by the DSA method with two targets in the (n, n'γ) reaction on the reactor fast neutrons.** Elenkov, D.V.; Lefterov, D.P.; Tumbev, G.Kh. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3337 (IPNO-T—81-03) **Study of the two-step process contribution to the one-nucleon transfer reactions ^{52}Cr(α,t) and ^{40}Ca(α,^{3}He).** Picot, P. (Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire; Paris-11 Univ., 91 - Orsay (France)). Jun 1981. 93p. (In French). NTIS (US Sales Only), PC A05/MF A01. Order Number DE82702808.

The ^{52}Cr(α,t)^{53}Mn and ^{40}Ca(α,^{3}He)^{41}Ca reactions have been studied at 36 MeV incident energy, together with the elastic and inelastic scattering of α-particles on ^{52}Cr. Outgoing particles were detected in the focal plane of a split-pole spectrometer, using a new detection set-up equipped with a gas position-sensitive counter. Angular distributions were measured from 6° to 60°, by 4° steps. The data reduction was done using a multipeak fitting code, here adapted to the conversational mode. The data have been analyzed with both the DWBA and the coupled-reaction-channel methods, using the α-optical potential determined in the present experiment. This analysis displays the important part of two-step processes in the (α,^{3}He) and (α,t) reaction mechanisms. In particular, it is shown that a number of high spin states in ^{41}Ca and ^{53}Mn are excited through pure two-step processes, with a characteristic Jsup(π) dependant angular distribution. Using this property, spin assignments are proposed for some previously unknown levels in ^{41}Ca and ^{53}Mn.

3338 (IPNO-TH—81-45) **Contribution of meson exchange currents to magnetic form factor of a few complex nuclei.** Mathiot, J.F. (Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire; Paris-6 Univ., 75 (France)). Dec 1981. 110p. (In French). NTIS (US Sales Only), PC A06/MF A01. Order Number DE82702799.

Thesis.

We were interested in the contribution of meson exchange currents (MEC) to the magnetic form factor (MFF) of ^{49}Ti, ^{51}V, ^{87}Sr, ^{93}Nb at high momentum transfer (1.8 fm^{-1} to 3.2 fm^{-1}). We found that the contribution of tensor correlations to the $^1S_0$ - $^3S_1$ transition of MEC (adding the $^3D_1$ tensor part to the $^3S_1$ relative state) multiply the previous calculations by a factor of 2.5 to 4. The sensitivity of MEC to the hadronic form factor is also estimated. It remains of discrepancy of a factor 2 for the MFF at 3 fm^{-1} for the first three nuclei.

3339 (ZfK—459, pp 150-152) **Activation analytical determination of cross sections of (N,α) reactions on intermediate mass nuclei at 3 MeV neutron energy.** Helfer, G.; Jahn, U. (Technische Univ., Dresden (German Democratic Republic). Sektion Physik); Florek, M.; Oravec, J.; Sarka, I. (Komenskeho Univ., Bratislava (Czechoslovakia)). Sep 1981. (In Russian). NTIS (US Sales Only), PC A10/MF A01.

From 10. international symposium on selected topics of the interaction of fast neutrons and heavy ions with atomic nuclei; Gaussig, F.R. Germany (17 Nov 1980).

Cross section measurements of (n,α) reactions in the intermediate mass nuclei region have been performed by activation analysis. The induced activity was measured by a high-sensitive detector operating in a regime of coincidences. Cross sections for ^{55}Mn at Esub(n) approximately 3 MeV are given.

3340 (ZfK—459, pp 153-157) **Gamma-ray multiplicities from ^{56}Fe(n,xnγ) reactions at 14.6 MeV.** Antalik, R.; Hlavac, S.; Oblozinsky, P. (Slovenska Akademia Vied, Bratislava (Czechoslovakia). Fyzikalny Ustav). Sep 1981. NTIS (US Sales Only), PC A10/MF A01.

From 10. international symposium on selected topics of the interaction of fast neutrons and heavy ions with atomic nuclei; Gaussig, F.R. Germany (17 Nov 1980).

γ multiplicities following emitted neutrons with energies 1 - 11 MeV as well as γ multiplicities of cascades pathing through 3 specific transitions were measured. Special attention was paid to the effect of angular correlations. The data provide insight into decay modes of ^{56}Fe in a rather broad region of excitation energies. The discrepancies with the results of the advanced statistical model should be resolved in a specific experiment. The total γ spectrum measured in the continuous region up to 19 MeV provides an evidence about nonstatistical character of fast neutron capture.

6516 Nuclear Properties And Reactions, A=59-89

REFER ALSO TO CITATION(S) 3312, 3336, 3338

3341 (INIS-SU—125, pp 66) **sup(73, 75, 85)Br isotope structure.** Chirt, V.K.; Nemashkalo, B.A.; Storizhko, V.E. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3342 (INIS-SU—125, pp 236) **Three-quasiparticle states in the ^{87}Y and the ^{191}Nb.** Isakov, V.I.; Belen'kij, V.M.; Badalov, S.A.; Volomyanskij, Eh.I. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3343 (INIS-SU—125, pp 272) **Estimation of the two neutron emission probability in beta decay of nuclei with A>=50.** Lyutostanskij, Yu.S.; Panov, I.V. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3344 (INIS-SU—125, pp 60) **Spins of the ^{67}Zn excited states below 2600 keV.** Kaipov, D.K.; Kosyak, Yu.G.; Chekushina, L.V. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3345 (INIS-SU—125, pp 61) **^{68}Ga levels excited in the (α, p, n, γ) reaction.** Aleksandrov, Yu.A.; Aprelev, M.V. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3346 (INIS-SU—125, pp 63) **Excitation of the high-lying states in ^{70}Ga.** Aleksansrov, Yu.A.; Aprelev, M.V. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3347 (INIS-SU—125, pp 64-65) **Lifetimes of the ^{70}Ge excited states.** Kiptilyj, V.G.; Lemberg, I.Kh.; Pasternak, A.A.; Rzhanov, B.I. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3348 (INIS-SU—125, pp 69) **^{77}Kr excited state lifetimes.** Zobov, A.E.; Lemberg, I.Kh.; Pasternak, A.A.; Rzhanov, B.I. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3349 (INIS-SU—125, pp 70) **Correlations of γ-ray directions in ^{86}Sr.** Muminov, A.I.; Ibragimov, W.; Kul'dzhanov, I.K.; Razhabbaev, R.; Il'khamov, R. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

6517 Nuclear Properties And Reactions, A=90-149

REFER ALSO TO CITATION(S) 2217, 3312, 3320-3338, 3342, 3343, 3502, 3502

3350 **(HEDL-SA—2703FP) Compilation of neutron precursor data.** Mann, F.M.; Schreiber, M.; Schenter, R.E.; England, T.R. (Hanford Engineering Development Lab., Richland, WA (USA); Los Alamos National Lab., NM (USA)). 1982. Contract AC06-76FF02170. 6p. (CONF-820942—11). NTIS, PC A02/MF A01. Order Number DE83000508.

From Nuclear data for science and technology international conference; Antwerp, Belgium (6 Sep 1982).

Portions of document are illegible.

Delayed neutron precursor data (yields and spectra) are being compiled in preparation of a new ENDF/B evaluation of delayed neutron data. Precursor P/sub n/ values have been updated using ENDF/B-VM yields, ENDF/B-V decay data, and consensus P/sub n/ values. Weighted averages of these P/sub n/ values are presented along with their effect on fission yields, P/sub n/ systematics, and model code calculations.

3351 **(HEDL-SA—2704-FP) Population of delayed-neutron granddaughter states and the optical potential.** Schenter, R.E.; Mann, F.M.; Warner, R.A.; Reeder, P.L. (Hanford Engineering Development Lab., Richland, WA (USA); Pacific Northwest Lab., Richland, WA (USA)). Aug 1982. Contract AC06-76FF02170. 5p. (CONF-820942—14). NTIS, PC A02/MF A01. Order Number DE83000507.

From Nuclear data for science and technology international conference; Antwerp, Belgium (6 Sep 1982).

Portions of document are illegible.

Using a statistical treatment of beta decay and the Hauser-Feshbach model of nuclear reactions, calculations were made and compared to recent experimental measurements of the population of granddaughter states of several delayed neutron precursors (^{144} ^{148} ^{147}Cs and ^{96}Rb). Emphasis of this paper is on the sensitivity and interpretation of experimental results to various standard low energy neutron optical model potentials and variations in their forms and parameters. Results for these precursors show qualitative agreement with experiment for all the optical potential models used and good quantitative agreement for two (Moldauer and Becchetti-Greenlees). Questions such as (N-Z) terms, deformation and nonlocality dependence are presented.

3352 **(INIS-mf—6988) Nuclear structure and reaction mechanism effects in quasi continuum gamma decay.** Hageman, D. (Rijksuniversiteit Groningen (Netherlands)). 3 Jul 1981. 205p. NTIS (US Sales Only), PC A10/MF A01. Order Number DE82780752.

Thesis.

In this thesis an investigation of nuclear structure and reaction mechanism effects is presented as they manifest themselves in the gamma-ray quasi-continua of residual nuclei produced in ^{12}C induced reactions. The author has studied the nuclear structure at high angular momentum and excitation energy of two heavy nuclei (^{152}Dy,^{156}Dy) that have a very different structure at low angular momentum and excitation energy. In addition the effect of the quasi-continuous gamma-decay process on the feeding of the yrast states (the states with the lowest excitation energy at a certain angular momentum) in these two rare earth nuclei has been investigated. The results are discussed in terms of collective and non-collective excitation modes. The interplay between these two types of motion of the nucleons in nuclei in the same mass region and its influence on the structure of the yrast states has been investigated in a search for high-spin isomeric states.

3353 (INIS-SU—125, pp 71) **Collective states of Mo, Ru, Pd, Cd even-even nuclei.** Zykov, Yu.Yu.; Sychikov, G.I. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3354 (INIS-SU—125, pp 72) **Relative probabilities of transitions between levels of two-phonon and three-phonon multiplets in ^{106}Pd and ^{110}Cd.** Shevelev, G.A. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3355 (INIS-SU—125, pp 74) **Multipolarities of gamma transitions in the ^{108}In decay.** Sychikov, G.I.; Yakobi, V.V. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3356 (INIS-SU—125, pp 109) **Probabilities of electromagnetic transitions in odd thulium isotopes with A=161-167.** Alikov, B.A.; Oadalov, Kh.N.; Zuber, K.; Malikov, M.M.; Muminov, T.M.; Muminov, K.M.; Tsoj, E.G.; Yashin, S.N. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3357 (INIS-SU—125, pp 177) **Effect of multipole-multipole interaction in a particle- particle channel on the high-lying excited state properties of Sm isotopes.** Nguen Dian' Tkhao; Stoyanov, Ch. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3358 (INIS-SU—125, pp 178) **Phase transition in the Yrast band of a rotating nonaxial nucleus.** Pavlichenkov, I.M. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3359 (INIS-SU—125, pp 190) **Influence of collective effects on charged radii of odd nuclei.** Krygin, G.B.; Dautov, L.M.; Kaipov, D.K.; Mitroshin, V.E. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3360 (INIS-SU—125, pp 191) **Manifestation of coexistence of superfluid and normal phases in mean-square charged radii of ^{12}Sb.** Krygin, G.B.; Dautov, L.M.; Kaipov, D.K.; Mitroshin, V.E. 1982. (In Russian). Dep. NTIS (US Sales Only).

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3361 (INIS-SU—125, pp 192) **Thermodynamic approach to the study of odd nucleus properties.** Krygin, G.B.; Dautov, L.M.; Kaipov, D.K.; Mitroshin, V.E. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3362 (INIS-SU—125, pp 195) **Collectivity of high excited octopole isoscalar resonance in ^{116}Sn.** Zhalov, M.B. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3363 (INIS-SU—125, pp 220) **Microsoopic calculation of effective nonsphericity of even-even atomic nuclei.** Asherova, R.M.; Ovcharenko, V.I.; Smirnov, Yu.F.; Filippov, G.F. 1982. (In Russian). Dep. NTIS (US Sales Only).

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3364 (INIS-SU—125, pp 237) **Structure of three quasiparticle spin states in the sup(117-119)Sb.** Isakov, V.I.; Belen'kij, V.M.; Badalov, S.A.; Volmyanskij, E.I. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3365 (INIS-SU—125, pp 243) **Microscopic consideration of the excitation collective modes in the Mo and Ru range.** Baktybaev, K.B.; Kabulov, A.B. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3366 (INIS-SU—125, pp 250) **Study on the double beta decay of ^{100}Mo.** Zdesenko, Yu.G.; Kuts, V.N.; Mytsyk, I.A.; Nikolajko, A.S. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3367 (INIS-SU—125, pp 253) **Threshold effects in change of the sup(90m)Nb isomer decay velocity.** Grechukhin, D.P.; Soldatov, A.A. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

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3369 (INIS-SU—125, pp 277) **Observation of the induced beta-gamma correlation in multiple cascades.** Denisenko, G.A.; Sorokin, A.A. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3370 (INIS-SU—125, pp 73) **Improved value of the g-factor for the 11/2$^-$ isomeric state in ^{107}Cd.** Zalyubovskij, I.I.; Kuznichenko, A.V.; Lebedev, V.N.; Levon, A.I.; Nemets, O.F.; Sevastyuk, O.V. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

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From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3372 (INIS-SU—125, pp 79) **Study on the ^{139}La in (n, n'γ) reaction.** Berzin', Ya.Ya.; Guseva, T.V.; Tamberg, Yu.Ya. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3373 (INIS-SU—125, pp 81) **2350-keV level quantum characteristics in ^{140}Ce.** Zhumamuratov, A.; Kalinnikov, V.G.; Stegajlov, V.I.; Novgorodov, A.F. 1982. (In Russian). Dep. NTIS (US Sales Only).

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3374 (INIS-SU—125, pp 83-84) **^{143}Nd levels from (n, n'γ) reaction.** Bondarenko, V.A.; Kuvaga, I.L. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3375 (INIS-SU—125, pp 86) **Study on the ^{147}Sm level scheme.** Avchukhov, V.D.; Baskova, K.A.; Bondarenko, V.A.; Vovk, A.B.; Gerus, T.M.; Govor, L.I.; Demidov, A.M. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3376 (INIS-SU—125, pp 529) **Evaluation of the pseudopotential parameter by measurements of Compton profile.** Aleshina, R.V.; Zajtsev, M.G.; Rad'ko, V.E. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3377 **(JINR—P3-82-305) Radiative strength functions of primary soft γ transitions and total radiation width.** Vtyurin, V.A. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Neutron Physics). 1982. 9p. (In Russian). Joint Institute for Nuclear Research, Dubna, USSR.

Estimates are drawn for the total radiative widths of ^{123}Te, ^{143}Nd, ^{147}Sm, and ^{149}Sm on the basis of experimental values of the strength functions of γ transitions between the compound states obtained in the study of (n, $\gamma\alpha$) reaction on these nuclei. A comparison of the estimates with the experimental values obtained for total radiative widths reveals a growth of radiative strength functions at E/sub γ/ > 1.6 MeV as compared with their values in the interval from 0.2 to 1.6 MeV. The estimates are also made for the radiative strength functions averaged over the energy interval from 1.6 to 4 MeV.

3378 **(JINR—P3-82-309) Extrapolation of the giant dipole resonance in the low-energy region.** Vtyurin, V.A.; Popov, Yu.P. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Neutron Physics). 1982. 10p. (In Russian). Joint Institute for Nuclear Research, Dubna, USSR.

The energy dependence of the strength function for E1 transitions was obtained in the energy interval 0.2 < E/sub γ/ < 1.6 MeV using the experimental spectra of (n$\gamma\alpha$) reaction and the earlier derived relationship of averaged over this interval values of radiation strength functions of E1 and M1 transitions. A comparison was drawn of these data, data on hard γ transitions and on photonuclear reaction on ^{124}Te and ^{144}Nd nuclei in the energy range from 0.2 to 20 MeV with several theoretical versions for the shape of the giant electric dipole resonance (GEDR). It was shown that neither the Lorentz nor Breit-Wagner shape of GEDR agreed with experimental data. At E/sub γ/ << E/sub g/ the value and shape of the dependence of the strength function on energy can be described, provided the properties of the polarization operator and the dependence of the width Γ/sub G/ on nuclear temperature of the final state are taken into account correctly.

3379 **(JYFL-RR—15/81) Microscopic structure of high-spin states in ^{130}Xe.** Loennroth, T.; Hattula, J.; Helppi, H.; Honkanen, K.; Kerek, A. (Jyvaeskylae Univ. (Finland). Dept. of Physics). Sep 1981. 13p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702812.

High-spin states in ^{130}Xe were populated in the reaction ^{130}Te(α,4n)^{130}Xe and studied using conventional gamma-ray spectroscopy. The ground-state band was observed up to its 10^+ member, and a high-spin quadrupole band built on the yrast 10^+ state at 2973 keV was observed up to a proposed (18^+) state at 6435 keV. A negative-parity band built on the yrast 7^- state at 2375 keV was observed to its (13^-) member at 4811 keV. Nine additional levels are reported below 4700 keV. The 7^- and 10^+ band heads are proposed to be two-quasiparticle states of the configurations (νhsub(11/2)$^{-1}$dsub(3/2^{-1})sub(7$^-$) and (sup)νsub(11/2)$^{-2}$)sub(10^+), respectively. The "odd" levels are interpreted, based on shell-model calculations, to be mostly two- and four-neutron-hole states. A 10^+ state at 3878 keV is proposed to be a proton excitation of the form (πhsub(11/2)^2)sub(10^+).

3380 (ZfK—459, pp 144-149) **Model calculations of fast-neutron induced reaction cross sections.** Herman, M.; An Jong Do; Marcinkowski, A. (Institute of Nuclear Research, Warsaw (Poland)). Sep 1981. NTIS (US Sales Only), PC A10/MF A01.

From 10. international symposium on selected topics of the interaction of fast neutrons and heavy ions with atomic nuclei; Gaussig, F.R. Germany (17 Nov 1980).

Statistical model of multistep nuclear reactions with the inclusion of compound nucleus and preequilibrium emission is presented. Full gamma cascade and angular momentum conservation are incorporated in both mechanisms. The results are compared with some experimental cross sections for (n,xn) reactions. Sugestions on spin distribution of intermediate states are drawn.

6518 Nuclear Properties And Reactions, A=150-189

REFER ALSO TO CITATION(S) 3283, 3312, 3330, 3369, 3403

3381 **(CEA-R—5146) Measurement of the lutetium 176 m γ-ray energies and intensities and half-life.** Lowental, G.; Bac, C.; Lagoutine, F; Morel, J.; Vatin, R. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France)). Nov 1981. 25p. (In French). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702804.

This project was undertaken to determine the intensities and the energies of γ transitions following the decay of sup(176m)Lu, and to provide reliable data for the measurement of sup(176m)Lu activity by γ spectrometry, this radionuclide being potentially useful to reactor radiation metrology, astrophysics and other aspects of nuclear science. At the time of this study, the only identifiable radionuclidic impurities in the sup(176m)Lu were 1.0% ^{177}Lu and 0.03 % ^{24}Na. The following quantities were determined: the absolute intensity 0.0890+-0.0015 of the principal γ radiation: 88.36 keV, the ratios of the intensities of HF X(K) rays to the intensity of the principal γ radiation, the half-life of sup(176m)Lu: 3.635+-0.003 h, the energies, the relative and absolute intensities of the other low intensity γ rays.

3382 (INIS-SU—125, pp 167) **Non-axial shape of nuclei.** Krutov, V.A. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3383 (INIS-SU—125, pp 211) **Quantitative characteristics of backbending of moment of inertia of atomic nuclei.** Muminov, A.I.; Safarov, R.Kh.; Usmanov, F.N.; Yuldashbaeva, Eh.Kh. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3384 (INIS-SU—125, pp 212) **Description of $5/2^+$ band of ^{259}Dy in the framework of particle + rotor model.** Mazepus, V.V. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3385 (INIS-SU—125, pp 215) **Calculation of spectra of microscopic limited collective hamiltonian for ^{170}Yb and ^{188}Os.** Svichylis, V.A.; Kalinauskas, R.K.U. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3386 (INIS-SU—125, pp 255) **Anomalous conversion and nuclear transitions with parity nonconservation.** Listengarten, M.A.; Ferecin, A.P. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3387 (INIS-SU—125, pp 283) **Matrix elements of penetration of the E1-transitions in the "modified" Nilsson model.** Sergeenkov, Yu.V.; Kharitonov, Yu.I. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3388 (INIS-SU—125, pp 352) **Parameters of spin distribution in the compound and the finite nuclei in the ^{160}Gd(^{16}O, xn)sup(176-X)Hf reaction.** Petrov, B.F.; Kamanin, V.V.; Ryudiger, Yu.; Ivanova, S.P.; Kraft, O.E.; Naumov, Yu.V.; Kobekov, V.V.; Loshchenko, V.A. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3389 (INIS-SU—125, pp 99-100) **Internal conversion electrons of the ^{152}Sm and ^{152}Gd transitions.** Troitskaya, A.G.; Kartashov, V.M.; Kim, V.S. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3390 (INIS-SU—125, pp 105-106) **^{159}Tb energy levels and their de-excitation in the (n, n'γ) reaction.** Bondarenko, V.A.; Simonova, L.I. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3391 (INIS-SU—125, pp 108) **Parameters of multipolarities mixing of the gamma transitions in the ^{160}Dy.** Ferentsei, J.; Finger, M.; Malinski, P.; Rzhikovsa, I.; Novakova, D. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3392 (INIS-SU—125, pp 112) **Probabilities of the K and L capture for the beta transition to 531.5 KeV level of the ^{167}Er.** Begzhanov, R.B.; Azimov, K.Sh.; Mirakhmedov, Sh.A.; Mukhammadiev, A.; Narzikulov, M.; Salimov, S.Kh. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3393 (INIS-SU—125, pp 113-114) **Parameters of the ^{169}Yb transition multipolarity mixing.** Kvasil, Ya.; Kratsikova, T.I.; Finger, M.; Davaa, S. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3394 (ISN—81-42) **Multi quasiparticle yrast states in ^{179}Ta.** Barneoud, D.; Andre, S.; Foin, C. (Grenoble-1 Univ., 38 (France). Inst. des Sciences Nucleaires). Aug 1981. 27p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE82702809.

Three 3-quasiparticle isomers with spins, parities and half-lives: 21/2$^-$, 350 ns at 1253.1 keV; 25/2$^+$, 9 ms at 1317.8 keV; 23/2$^-$, 1,6 μs at 1328.4 keV and their associated rotational bands have been identified in ^{179}Ta. The [gsub(K) - g(sub(R)] values deduced from the branching ratios are in good agreement with the proposed configurations. Two other isomers: 37/2$^+$, 52 ms at 2640.6 keV and 33/2$^-$, 22 ns at 2794.1 keV are interpreted as 5-quasiparticle states.

3395 (JINR-R—1-81-753) **Processes with production of heavy stripping fragments in interactions of α particles with tantalum and propane at 4.2 GeV/c per nucleon.** Gasparyan, A.P.; Erofeeva, I.N.; Ivanovskaya, I.A. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of High Energy). 1981. 10p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702810.

13 refs.; 3 figs.; 1 tab.; submitted to the journal Sov. J. Nucl. Phys.

Cross sections of ^{3}He, ^{3}H and ^{2}H stripping fragment production in collisions of α-particles with tantalum and propane at 4.2 GeV/c per nucleon are determined. The negative and charge particle multiplicities in these events are obtained. The experimental values of the cross sections are in good agreement with the multiscattering model. It is shown that the dependence of probabiliby of ^{3}He, ^{3}H and ^{2}H fragments emission on the nucleus- target atomic weight is described by the multiscattering model. Experimental data on negative particles multiplicity in the events with the ^{3}He and ^{3}H fragments escape, correspond to the interaction of one bombarding nucleon. The multiplicity value obtained coincides with the average multiplicity value in nucleon-nucleon interactions normalized for inelastic cross section.

6519 Nuclear Properties And Reactions, A=190-219

REFER ALSO TO CITATION(S) 3283, 3312, 3320, 3380

3396 (INIS-SU—125, pp 169) **Determination of the spin velocity force values on the base of ^{208}Pb energy state analysis.** Tolokonnikov, S.V.; Khafizov, R.U. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3397 (INIS-SU—125, pp 174) **Spin-dependent effective nucleon-nucleon interaction in nuclei.** Borzov, I.N.; Fayans, S.A. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3398 (INIS-SU—125, pp 204) **Magnetic properties of nuclei in the range of ^{208}Pb.** Dimitriev, V.F.; Telitsin, V.B. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3399 (INIS-SU—125, pp 284) **Effect of the Coriolis interaction on the penetration matrix elements of the M3-transition in ^{191}Os.** Sergeenkov, Yu.V.; Kharitonov, Yu.I. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3400 (INIS-SU—125, pp 285) **Effect of atomic screening on the nuclear transitions.** Kuzhir, P.G.; Trofimenko, E.E. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3401 (INIS-SU—125, pp 396) **Elastic scattering of electrons and protons on complex nuclei.** Dzhavadov, A.V.; Mirabutalybov, M.M. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3402 (INIS-SU—125, pp 428) **Deuteron break-up in the process of elastic scattering in electric field of heavy nuclei.** Verbitskij, V.P.; Terenetskij, K.O. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3403 (IPNO-RC—81-07) **Precise alpha energy measurements of many neutron deficient isotopes of W, Re, Os, Ir, Pt.** Della Negra, S.; Deprun, C.; Jacquet, D.; Le Beyec, Y. (Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire). 1981. 8p. (In French). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702807.

Precise alpha energy measurements of neutron deficient isotopes of W, Re, Os, Ir and Pt have been performed. The α energy calibrations have been made with the α rays emitted by a standard source of ^{212}Bi-^{212}Po, and the α rays of well known isotopes of Ho, Er, Tm.

3404 (JINR—P4-82-358) **Fragmentation of deeply-bound hole states in ^{207}Pb and $^{203\ 205\ 207}$Tl.** Voronov, V.V.; Solov'ev, V.G.; Stoyanov, Ch. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics). 1982. 10p. (In Russian). Joint Inst. for Nuclear Research, Dubna, USSR.

Within the quasiparticle-phonon nuclear model the fragmentation of some deeply-bound hole states in ^{207}Pb and $^{203\ 205\ 207}$Tl is calculated. The model wave function includes the quasiparticle plus phonon and quasiparticle plus two phonons components. The good agreement with the experimental data for the spectroscopic factors of low-lying states in ^{207}Pb and ^{207}Tl is obtained. The integral characteristics of deeply-bound hole states, which are excited in the ^{208}Pb(^{3}He,α)^{207}Pb reaction, are correctly described.

3405 (Juel-Conf—45, pp 215-240) **High energy particle spectra from spallation targets.** Cierjacks, S.; Raupp, F.; Howe, S.D.; Hino, Y.; Swinhoe, M.T.; Rainbow, M.T.; Buth, L. Oct 1981. NTIS (US Sales Only), PC A99/MF A01.

From 5. meeting of the international collaboration on advanced neutron sources; Julich, F.R. Germany (22 Jun 1981).

The experimental program of high energy spectra measurements performed in conjunction with the feasibility study for a German spallation source is surveyed. This program included the measurement of angular and depth dependent neutron and charged-particle yields and spectra from thick targets, the determination of high energy neutron spectra associated with moderated beams and the measurements of neutron and charged-particle production cross sections from various thin targets by 590 and 1100 MeV protons. Since absolute measurements of neutron data depend on the accurate knowledge of the neutron detection efficiency of scintillation counters, auxiliary measurements of this quantity were performed in the neutron region 50 to 450 MeV.

3406 (Juel-Conf—45, pp 261) **Summary on the workshop session A-2 spallation products.** Peek, N.F. Oct 1981. NTIS (US Sales Only), PC A99/MF A01.

From 5. meeting of the international collaboration on advanced neutron sources; Julich, F.R. Germany (22 Jun 1981).

3407 (Juel-Conf—45, pp 343-354) **Gamma-ray spectrometric product identification and halflife analysis from proton induced spallation and fission reactions of lead and uranium.** Amian, W.; Peek, N.F.; Shadoan, D.J. Oct 1981. NTIS (US Sales Only), PC A99/MF A01.

From 5. meeting of the international collaboration on advanced neutron sources; Julich, F.R. Germany (22 Jun 1981).

A computer aided analysis system has been developed for measuring the product yield distribution from proton induced spallation reactions. This system is based on gamma-ray spectrometric identification of product radio-activities in the irradiated target materials lead and uranium. Gamma-ray spectra are collected as a function of time. All peaks and peak areas are identified and measured with the computer code AGAMEMNON. Decay curves for all gamma-rays observed in the measured spectra are constructed and analyzed by the computer code YELLOW. The essential features of YELLOW are: any number of nuclides may be fitted to the experimental data, parent-daughter decays are included, the complete Erdmann-Soyka library is used, the program prepares a collection of plots containing all neccessary information to decide on the correctness of the program's assignment.

3408 (Juel-Conf—45, pp 355-375) **Gamma-ray measurements of isotopes produced by 1.1 GeV protons on lead and uranium targets.** Peek, N.F.; Shadoan, D.J.; Amian, W. Oct 1981. NTIS (US Sales Only), PC A99/MF A01.

From 5. meeting of the international collaboration on advanced neutron sources; Julich, F.R. Germany (22 Jun 1981).

In order to simulate the spallation neutron source target, 3 cm diameter by 1 mm thick diks of Pb and U with Al monitoring foils and plates were irradiated at the Saturne National Laboratory at Saclay, France. The targets were embedded between 5 cm thick bricks (either natural Pb or depleted U). The overall target was 45 cm thick. In the case of the Pb experiment, 10 targets were included and for U, eight or nine. The study is progressing and has provided, so far, information on some 65 isotopes found in the 5 cm deep Pb target. Results are shown in the form of activities and atoms produced per incident proton. It will be possible to integrate the activities over all of the targets and estimate the isotope production, radioactive heat developed and, perhaps, the ensuing damage to the target materials.

6520 Nuclear Properties And Reactions, A=220 And Above

REFER ALSO TO CITATION(S) 2217, 3283, 3320, 3407, 3408, 3499, 3500, 3501

3409 (DOE/ER/70031—9) **Delayed-neutron spectra from fast fission. Final report.** Woodruff, G.L.; Johnson, D.L.; Grant, P. (Washington Univ., Seattle (USA). Dept. of Nuclear Engineering). 1980. Contract AT06-76ER70031. 7p. NTIS, PC A02/MF A01. Order Number DE83000356.

The measured ^{240}Pu delayed neutron equilibrium spectrum from fast fission is presented and briefly discussed. (WHK)

3410 (EGG-M—05982) **Work of the IAEA Coordinated Research Programme on the measurement and evaluation of transactinium-isotope nuclear-decay data.** Reich, C.W. (Idaho National Engineering Lab., Idaho Falls (USA)). 1982. Contract AC07-76ID01570. 5p. (CONF-820942—12). NTIS, PC A02/MF A01. Order Number DE83000590.

From Nuclear data for science and technology international conference; Antwerp, Belgium (6 Sep 1982).

In 1977, the IAEA organized a Coordinated Research Program to address the needs for precise actinide-isotope decay data identified at the first Advisory Group Meeting on Transactinium Isotope Nuclear Data, held in Karlsruhe in 1975. During the years of its existence, this CRP has made significant strides toward achieving the goals outlined at Karlsruhe. In this paper, we discuss the make-up of the CRP and its work in the areas of decay-data evaluation and measurement. The objectives of the evaluation effort and some of the results to date are summarized. The measurement activity being carried out within the various participating laboratories is presented. Finally, the significant accomplishments resulting from the work of the CRP participants are discussed, together with those tasks which remain to be done in order to be fully responsive to the goals of the Program as envisioned at Karlsruhe.

3411 (EGG-M—17982) **Report on the participation of US laboratories in the work of the IAEA coordinated research program on the measurement of transactinium-isotope nuclear-decay data.** Reich, C.W. (Idaho National Engineering Lab., Idaho Falls (USA)). 1982. Contract AC07-76ID01570. 6p. (CONF-820963—1). NTIS, PC A02/MF A01. Order Number DE83000591.

From 5. coordinated research meeting on measurement and evaluation of transactinium isotope nuclear data; Geel, Belgium (1 Sep 1982).

The current status of the work being carried out in various US laboratories specifically oriented toward the objectives of this IAEA CRP is briefly reviewed. Reported are the gamma-ray emission-probability measurements, and related studies, at INEL, the half-life measurements being done by the participants in the US Half-Life Evaluation Committee (ANL, LANL, LLNL, Mound Lab., NBS and Rocky Flats), and the absolute α-intensity measurements at ANL.

3412 (INIS-SU—125, pp 273) **Beta spectrum of fissionable nuclides and delayed neutron yield.** Lyutostanskij, Yu.S.; Rubtsov, P.M.; Ruzhanskij, P.A.; Khandogin, V.I. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3413 (INIS-SU—125, pp 511) **Measuring the intensity of XL radiation during ^{238}Pu and ^{239}Pu decay.** Gejdel'man, A.M.; Egorov, Yu.S.; Nedovesov, V.G.; Plkh, I.; Khol'nov, Yu.V.; Chereshkevich, Yu.L.; Chechev, V.P.; Shchukin, G.E.; Yasanovski, P. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3414 **(JINR-R—3-81-601) Multilevel parametrization of the ^{239}Pu total cross section in the resonance region on the basis of neutron transmission analysis.** Bakalov, T.; Il'chev, G.; Toshkov, S.; Ukraintsev, V.F.; Chan Khan' Maj; Yaneva, N. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Neutron Physics). 1981. 8p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702811.

Multilevel resonance parameters of total cross section of Pu-239 are derived in the Adler scheme from thick sample neutron transmission data analysis in 4-50 eV energy region. Samples with the thickness from 0.0165 to 0.1084 nuclei/barns were used in the analysis that gets reliable determination of resonance - resonance interference parameter and allows to describe the neutron cross sections structure. Average total cross sections and their self-shielding factors in dependence on temperature (300, N00, 1200K) and dilute cross sections are calculated using the parameters.

3415 (Juel-Conf—45, pp 333-342) **Neutron production yields and spectra from 590 MeV proton bombardment of thick uranium targets.** Raupp, F.; Cierjacks, S.; Hino, Y.; Howe, S.D.; Rainbow, M.T.; Swinhoe, M.T.; Buth, L. Oct 1981. NTIS (US Sales Only), PC A99/MF A01.

From 5. meeting of the international collaboration on advanced neutron sources; Julich, F.R. Germany (22 Jun 1981).

Time-of-flight measurements of neutrons produced by bombardment of a thick uranium target with 590 MeV protons have been performed at SIN cyclotron. Measurements were made at angles of 30°, 90° and 150° relative to the incident proton beam for different penetration depths of protons in a 10 cm x 10 cm x 40 cm long target. The detector was a liquid scintillator. Differential and integral neutron data are presented and discussed.

3416 (Juel-Conf—45, pp 621-639) **Fertile-to-fissile and fission measurements for depleted uranium bombarded by 800-MeV protons.** Russell, G.J.; Gilmore, J.S.; Robinson, H.; Prael, R.E. Oct 1981. NTIS (US Sales Only), PC A99/MF A01.

From 5. meeting of the international collaboration on advanced neutron sources; Julich, F.R. Germany (22 Jun 1981).

Axial distributions of fertile-to-fissile conversions (^{238}U to ^{239}Pu) and fissions have been measured for a thick depleted uranium target bombarded by 800-MeV protons. We determine the ^{239}Pu production by measuring the amount of ^{239}Np produced. We integrate the axial distributions to get the total conversions and fissions occurring in the target. Our preliminary experimental results give 3.81 +- 0.19 ^{239}Np atoms produced per incident proton and 5.59 +- 0.56 fissions per incident proton. Corresponding calculated results are 3.46 +- 0.05 and 3.93 +- 0.06. The computations did not include the effects of high-energy fission competition with evaporation. We also report measured axial distributions of ^{237}U and eleven fission products produced in the target. Our preliminary experimental data give 0.95 +- 0.05 ^{237}U atoms made per incident proton.

3417 (Juel-Conf—45, pp 641-664) **Spallation in a nuclear energy system.** Heindler, M. Oct 1981. NTIS (US Sales Only), PC A99/MF A01.

From 5. meeting of the international collaboration on advanced neutron sources; Julich, F.R. Germany (22 Jun 1981).

There is a prospect that intense spallation neutron sources may become an efficient tool in alleviating some crucial problems troubling the fission reactor economy. However, the recent concept promotion seems to be based on fragmentary design and engineering considerations and inadequate system characterization. Premature claims may serve short term interests, but may also increase the chance that spallation research be eventually hit by public acceptance problems, if perceived as closely associated with the deployment of fission reactors. Therefore, a careful investigation of the actual benefits of associating fission reactors with intense spallation neutron sources is required. As an illustrative example for a static and dynamic impact assessment, the merits of intense spallation neutron sources as fissile fuel factories for fission converter reactors are investigated and numerical results are presented for typical design proposals.

3418 **(LA-UR—82-2643) Calculation of ^{239}Pu neutron inelastic cross sections.** Arthur, E.D. (Los Alamos National Lab., NM (USA)). 1982. Contract W-7405-ENG-36. 5p. (CONF-820942—10). NTIS, PC A02/MF A01. Order Number DE83000662.

From Nuclear data for science and technology international conference; Antwerp, Belgium (6 Sep 1982).

Portions of document are illegible.

We have calculated cross sections for neutron-induced reactions on ^{239}Pu between 0.001 and 5 MeV, with particular emphasis on inelastic scattering. Coupled-channel and Hauser-Feshbach statistical models were used. Within the coupled-channel calculations we employed neutron optical parameters derived from simultaneous fits to total, elastic, inelastic, and resonance data. The resulting transmission coefficients were used in Hauser-Feshbach statistical calculations having a fission channel based on a double-humped barrier representation. Barrier parameters and transition state enhancements needed to reproduce well the (n,f) cross sections between 0.001 and 5 MeV were in general agreement with those from other published analyses. Calculated compound-nucleus and direct-reaction components for inelastic scattering were combined incoherently, and the resultant cross sections agreed well with the Bruyeres-le-Chatel measurements for scattering from levels occupying the ground state rotational band. Our results are in substantial disagreement with ENDF/B-V values for these levels. We are presently performing DWBA calculations to determine direct-reaction components for states occupying higher-lying vibrational bands.

3419 (ZfK—459, pp 40-47) **Absolute fission cross section measurement on ^{236}U at 2.6 MeV neutron energy.** Alkhazov, I.D.; Vitenko, V.A.; Dushin, V.N.; Kostochkin, O.I.; Petrzhak, K.A.; Fomichev, A.V.; Shpakov, V.I.; Malkin, L.Z. (Radievyj Inst., Leningrad (USSR)); Arlt, R.; Wagner, W. Sep 1981. (In Russian). NTIS (US Sales Only), PC A10/MF A01.

From 10. international symposium on selected topics of the interaction of fast neutrons and heavy ions with atomic nuclei; Gaussig, F.R. Germany (17 Nov 1980).

The fission cross section of ^{236}U at 2.6 MeV neutron energy was measured absolutely applying the time correlated associated particle method. The experimental set-up is described, errors and corrections are given.

3420 (ZfK—459, pp 51-53) **Measurement of fission cross-section ratios using track-etched detectors.** Varnagy, M.; Juhasz, S.; Csikai, J.; Siddique, M.A.B.; Raics, P. (Kossuth Lajos Tudomanyegyetem, Debrecen (Hungary). Kiserleti Fizikai Intezet). Sep 1981. NTIS (US Sales Only), PC A10/MF A01.

From 10. international symposium on selected topics of the interaction of fast neutrons and heavy ions with atomic nuclei; Gaussig, F.R. Germany (17 Nov 1980).

Fission cross-section ratios of ^{238}U/^{235}U, ^{238}U/^{237}Np, ^{235}U/^{237}Np and ^{239}Pu/^{235}U were determined in the range of 13.5-14.8 MeV neutron energy. The fission fragments were detected by a polycarbonate solid state nuclear track detector (SSNTD).

3421 (ZfK—459, pp 68-71) **Fine structure observation and analysis in the near fission threshold of Th isotopes.** Blons, J.; Mazur, C.; Paya, D.; Ribrag, M. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France)); Weigman, H. (BNM, Geel (Belgium)). Sep 1981. NTIS (US Sales Only), PC A10/MF A01.

From 10. international symposium on selected topics of the interaction of fast neutrons and heavy ions with atomic nuclei; Gaussig, F.R. Germany (17 Nov 1980).

High resolution measurements reveal the presence of a fine structure in the gross resonances located near the fission threshold of ^{230}Th and ^{232}Th + neutron. The properties of such a structure can be understood only in the framework of a third minimum in the fission barrier. As predicted by the calculations, the metastable states in this minimum have a stronger quadrupole deformation than in the second minimum and an octupole deformation.

3422 (ZfK—459, pp 72-77) **Features of the energy dependence of a mean number of prompt fission neutrons.** Kuz'minov, B.D.; Malinovskij, V.V.; Piksajkin, V.M.; Semenova, N.N. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk. Fiziko-Ehnergeticheskij Inst.). Sep 1981. (In Russian). NTIS (US Sales Only), PC A10/MF A01.

From 10. international symposium on selected topics of the interaction of fast neutrons and heavy ions with atomic nuclei; Gaussig, F.R. Germany (17 Nov 1980).

Measurement method and results of the energy dependence of prompt neutrons emitted at the fission of ^{236}U, ^{233}U, and ^{237}Np are presented. The experimental data analysis of prompt neutrons and of the kinetic energies of fission fragments is discussed.

3423 (ZfK—459, pp 98-101) **High-energetic neutron emission in fission.** Maerten, H.; Seeliger, D. (Technische Univ., Dresden (German Democratic Republic)). Sep 1981. NTIS (US Sales Only), PC A10/MF A01.

From 10. international symposium on selected topics of the interaction of fast neutrons and heavy ions with atomic nuclei; Gaussig, F.R. Germany (17 Nov 1980).

First experimental results of our investigations of the high-energetic part of fission neutron spectra indicate the existence of a spectrum component with an average energy of about 4 MeV (14.6 MeV neutron induced fission of 238-U analysed in the spectrum energy range 20 - 30 MeV). Some possible sources of high-energetic fission neutrons are discussed.

3424 (ZfK—459, pp 137-140) **Shell effects in the element distribution of the $^{238}U + ^{238}U$ reaction.** Maedler, P.; Schmidt, R.; Teichert, J. (Technische Univ., Dresden (German Democratic Republic). Sektion Physik). Sep 1981. NTIS (US Sales Only), PC A10/MF A01.

From 10. international symposium on selected topics of the interaction of fast neutrons and heavy ions with atomic nuclei; Gaussig, F.R. Germany (17 Nov 1980).

For the investigation of the U+U element distribution a Fokker-Planck equation has been used where the mass drift coefficient is calculated from a shell-corrected liquid drop potential. The discussion leads to the result that the experimental element distribution may be influenced by the shell structure of the nuclei.

6530 Nuclear Theory

3425 (DOE/ER/05126—158) **Nuclear dissipation as damping of collective motion in the time-dependent RPA and extensions of it.** Yannouleas, C.P. (Maryland Univ., College Park (USA). Dept. of Physics and Astronomy). Jul 1982. Contract AS05-76ER05126. 91p. (ORO—5126-158). NTIS, PC A05/MF A01. Order Number DE83000808.

We have formulated a nonperturbative, microscopic dissipative process in the limit of an infinite mean free path which does not require any statistical assumptions. It attributes the damping of the collective motion to real transitions from the collective state to degenerate, more complicated nucelar states. The dissipation is described through wave packets which solve an approximate Schroedinger equation within extended subspaces, larger than the original subspace of the undamped motion. When the simple RPA is used, this process associates the dissipation with the escape width for direct particle emission. When the Second RPA is used, it associates the dissipation with the spreading width for transitions to the 2p-2h components of the nuclear compound states. The energy loss rate for sharp n-phonon initial states is proportional to the total collective energy. The classical dissipation, however, is obtained for coherent, multiphonon, initial packets which describe the damping of the mean field oscillations, and allow a theoretical connection with the Vibrating Potential Model, and thereby with models of one-body dissipation. The present model contrasts with linear response theories. Canonical coordinates for the collective degree of freedom are explicitly introduced. This allows the construction of a nonlinear frictional Hamiltonian which provides a connection with quantal friction. The dissipation process developed here is properly reversible rather than irreversible, in the sense that it is described by an approximate Schroedinger equation which honors time reversibility, rather than by a coarse grained master equation which violates it. Thus, the present theory contrasts with transport theories.

3426 (INIS-mf—6819, pp 485) **Some specific features of the scattering problem in the oscillator representation.** Nechaev, Yu.I.; Smirnov, Yu.F. 1981. (In Russian). NTIS (US Sales Only), PC A99/MF A01.

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

3427 (INIS-mf—6991) **Particle-hole interaction and pion condensation in nuclear matter.** Dickhoff, W.H. (Vrije Univ., Amsterdam (Netherlands)). 23 Oct 1981. 141p. NTIS (US Sales Only), PC A07/MF A01. Order Number DE82780751.

Thesis.

Following a general introduction in chapter one, the second chapter describes the calculation of the pion p-wave self-energy in nuclear matter. This quantity represents the amount of binding a pion gains by interacting with the medium. The third chapter exploits the formalism developed to work out a simple conclusion which can be drawn from the general notion of the divergence of a series of diagrams. Clearly, if the pion propagator in the medium develops a pole at some density, this implies that the one-pion-exchange NN interaction in the medium will be drastically modified. In Chapter four, the contribution to the binding energy of nuclear matter is calculated for a special set of diagrams - ring diagrams. Finally, in chapter five the low and intermediate momentum components of the nuclear matter G matrix which are relevant for nuclear structure, are studied.

3428 (INIS-mf—7173) **Variational, projection methods, and Pade approximants in scattering theory.** Turchetti, G. (Pontificia Univ. Catolica do Rio de Janeiro (Brazil). Inst. de Fisica). Dec 1980. 104p. NTIS (US Sales Only), PC A06/MF A01. Order Number DE82780805.

Several aspects on the scattering theory are discussed in a perturbative scheme. The Pade approximant method plays an important role in such a scheme. Solitons solutions are also discussed in this same scheme.

3429 (INIS-mf—7192) **Introduction of a relativistic space-time structure and causality in quantum mechanics.** Gerstberger, H. (Marburg Univ. (Germany, F.R.). Fachbereich Physik). 22 Jun 1980. 43p. (In German). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82780806.

Thesis.

The author introduces the space-time structure given by the Minkowski space to quantum mechanics. In this connection the quantum mechanical measuring process is discussed.

3430 (INIS-SU—125, pp 53) **Single-particle properties of the s-d shell nuclei.** Kapitonov, I.M.; Shumakov, A.V. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3431 (INIS-SU—125, pp 140) **Generalized density matrix in Lipkin model.** Belyaev, S.T.; Pavlichenkov, I.M. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3432 (INIS-SU—125, pp 143) **State density of the deformed nuclei.** Malov, L.A. 1982. (In Russian). Dep. NTIS (US Sales Only).

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3433 (INIS-SU—125, pp 145) **Fragmentation of the two-quasiparticle states and the neutron strength functions in the even-even deformed nuclei.** Malov, L.A. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3434 (INIS-SU—125, pp 146) **Dynamic amplification of the parity nonconservation in the neutron resonances and the giant 0^- resonances.** Kadmenskij, S.G.; Markushev, V.P.; Furman, V.I. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3435 (INIS-SU—125, pp 147) **Atomic nucleus superfluidity and phonon polarizability.** Kadmenskij, S.G.; Furman, V.I. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3436 (INIS-SU—125, pp 149) **K nonconservation in the neutron resonances and spin dependence of the neutron strength function of the deformed nuclei.** Kadmenskij, S.G.; Markushev, V.P.; Popov, Yu.P.; Furman, V.I. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3437 (INIS-SU—125, pp 150) **Effective numbers of clusters with Asub(c)>=4 in the nuclei.** Kadmenskij, S.G.; Chuvil'skij, Yu.M. 1982. (In Russian). Dep. NTIS (US Sales Only).

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3438 (INIS-SU—125, pp 151) **Generalization of the random phase method.** Kamerdzhiev, S.P.; Tselyaev, V.I. 1982. (In Russian). Dep. NTIS (US Sales Only).

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3440 (INIS-SU—125, pp 158) **Mass formula for heavy nuclei on the basis of the Wigner SU(4) symmetry.** Gaponov, Yu.V.; Shul'gina, N.B. 1982. (In Russian). Dep. NTIS (US Sales Only).

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3441 (INIS-SU—125, pp 163) **States of the 9-quarks system and problem of three-particle forces in nuclei.** Neudachin, V.G.; Obukhovskij, I.T.; Smirnov, Yu.F.; Tkalya, E.V. 1982. (In Russian). Dep. NTIS (US Sales Only).

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3442 (INIS-SU—125, pp 166) **Description of the main nuclear characteristics by the semiphenomenological nuclear theory.** Krutov, V.A.; Krutova, L.A. 1982. (In Russian). Dep. NTIS (US Sales Only).

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3499 (Juel-Conf—45, pp 281-298) **Comparison of high-energy fission models for the HETC transport code. Pt. 1.** Armstrong, T.W.; Filges, D. Oct 1981. NTIS (US Sales Only), PC A99/MF A01.

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Calculation have been made to compare results from high-energy fission models which have recently been developed by others for use in the high-energy transport code HETC. The cases considered are proton beam energies of 0.3, 1.0, and 2.9 GeV bombarding thin U-238 targets. Comparisons are given for fission cross sections, neutron production, and fission fragment energies.

3500 (Juel-Conf—45, pp 299-312) **Comparison of high-energy fission models for the HETC transport code. Pt. 2.** Armstrong, T.W.; Cloth, P.; Filges, D.; Neef, R.D. Oct 1981. NTIS (US Sales Only), PC A99/MF A01.

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To clarify the influence on practical calculational problems of the different High-Energy Fission models and the relationship between the models, a series of calculations were performed and partly compared with existing experimental data taken from the BNL-Cosmotron experiment.

3501 **(Juel-Spez—131) Coulomb dissociation at nonrelativistic and relativistic energies.** Hoffmann, B. (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Inst. fuer Kernphysik). Oct 1981. 92p. (In German). NTIS (US Sales Only), PC A05/MF A01. Order Number DE82750588.

The author studies the breakup of deuterons on nuclei in the framework of DWBA theories which are based on the spectator model. The discrepancies for heavy targets are explained by the mechanism of the Coulomb dissociation.

3502 **(LBL—14824) High-spin states.** Stephens, F.S. (Lawrence Berkeley Lab., CA (USA)). Aug 1982. Contract AC03-76SF00098. 15p. (CONF-820828—6). NTIS, PC A02/MF A01. Order Number DE83000498.

From 9. EPS Nuclear Physics Divisional conference on nuclear structure; Amsterdam, Netherlands (29 Aug 1982).

Portions of document are illegible.

Nuclei generate high spins by two methods, alignment of single particle angular momentum and collective rotation. The competition of these two modes is discussed first in general terms, then in the spin region below $\sim$ 40 dirac constant, and finally for the highest spins $40 \leqq I \leqq 65$ dirac constant. Some prognosis for future experiments in this field is given.

3503 (ZfK—459, pp 106-111) **Application of Wigner-transformations in heavy ion reactions.** Esbensen, H. (Nordisk Inst. for Teoretisk Atomfysik, Copenhagen (Denmark)). Sep 1981. NTIS (US Sales Only), PC A10/MF A01.

From 10. international symposium on selected topics of the interaction of fast neutrons and heavy ions with atomic nuclei; Gaussig, F.R. Germany (17 Nov 1980).

One of the main features of inelastic heavy ion reactions is the excitation of collective surface vibrations. It is discussed a model, based on Wigner transformations and classical dynamics, that gives a semiclassical description of the excitation of surface vibrations due to the Coulomb and nuclear interaction in heavy ion collisions. The treatment consists of three stages, viz. the preparation of classical initial conditions compatible with the quantal ground state of surface vibrations, the dynamical evolution of the system governed by Liouville's equation (i.e. classical mechanics) and finally the interpretation of final results after the interaction in terms of excitation probabilities, elastic and inelastic cross sections etc. The first and the last stage are exact and based on the Wigner transformations while the time evolution described by classical mechanics is an approximation. Application examples are given.

3504 (ZfK—459, pp 122-127) **Resonance phenomena in heavy ion reactions.** Rotter, I. (Zentralinstitut fuer Kernforschung, Rossendorf bei Dresden (German Democratic Republic)). Sep 1981. NTIS (US Sales Only), PC A10/MF A01.

From 10. international symposium on selected topics of the interaction of fast neutrons and heavy ions with atomic nuclei; Gaussig, F.R. Germany (17 Nov 1980).

On the basis of the continuum shell model, it is shown that the shape resonances may have doorway properties. Together with the unitarity of the S-matrix these properties of the shape resonances may lead to an l-dependent transparency of the optical potential.

3505 (ZfK—459, pp 128-136) **Dynamical potentials and charge equilibration in deep-inelastic HI-collisions.** Hefter, E.F. (Hannover Univ. (Germany, F.R.). Inst. fuer Theoretische Physik); Gridnev, K.A. (Leningradskij Gosudarstvennyj Univ. (USSR)). Sep 1981. NTIS (US Sales Only), PC A10/MF A01.

From 10. international symposium on selected topics of the interaction of fast neutrons and heavy ions with atomic nuclei; Gaussig, F.R. Germany (17 Nov 1980).

In the search for a unified approach to nuclear physics and for dynamical equations for the nuclear potential we step back to consider one-dimensional relations. We discuss the applicability of the soliton concept to nuclear physics. Quantitative and even more preliminary qualitative results support the notion to view the Korteweg - de Vries equation (KdVE) with its extensions as the phenomenological counterpart to the equation of the mass operator, thus providing us with a tractable model for the dynamical nuclear potential.

3506 (ZfK—459, pp 205-207) **Sum rules for inelastic scattering of electrons and nucleons.** Blokhin, A.I.; Ignatyuk, A.V.; Lunev, V.P. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk. Fiziko-Ehnergeticheskij Inst.). Sep 1981. (In Russian). NTIS (US Sales Only), PC A10/MF A01.

From 10. international symposium on selected topics of the interaction of fast neutrons and heavy ions with atomic nuclei; Gaussig, F.R. Germany (17 Nov 1980).

Differences of form factors of direct transitions in inelastic scattering processes of electrons and nucleons are analyzed. The corresponding intensities of multipole excitations are determined.

3507 **(ZfK—459) Proceedings of the 10. International Symposium on Selected Topics of the Interaction of Fast Neutrons and Heavy Ions with Atomic Nuclei.** Musiol, G.; Wagner, W.; Josch, M. (eds.). (Zentralinstitut fuer Kernforschung, Rossendorf bei Dresden (German Democratic Republic)). Sep 1981. 212p. (CONF-8011171—). NTIS (US Sales Only), PC A10/MF A01. Order Number DE83780037.

From 10. international symposium on selected topics of the interaction of fast neutrons and heavy ions with atomic nuclei; Gaussig, F.R. Germany (17 Nov 1980).

Separate abstracts were prepared for papers from this meeting. (KAW)

6540 Radiation And Shielding Physics

REFER ALSO TO CITATION(S) 1832, 2805, 2825, 2833, 2847, 2925, 3170, 3183

3508 **(AD-A—951600/6) Lorentz transformation of the equation of radiative transfer: the scattering kernel for Compton and inverse Compton processes.** Pomraning, G.C. (Gulf General Atomic Co., San Diego, CA (USA)). 1 Nov 1968. 34p. (GA—9035). NTIS, PC A03/MF A01.

3509 (INIS-mf—6819, pp 537) **Up-to-date status of investigations into energy of ion production in matter.** Semenov, Yu.V. 1981. (In Russian). NTIS (US Sales Only), PC A99/MF A01.

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

3510 **(INIS-mf—7098) Liquids nitrogen, oxygen and helium-4 studied by neutron scattering.** Pedersen, K.S. (Danmarks Tekniske Hoejskole, Lyngby). 1980. 112p. NTIS (US Sales Only), PC A06/MF A01. Order Number DE82780796.

Thesis.

The work falls in three parts: Neutron diffraction on liquid nitrogen and liquid oxygen; Neutron inelastic scattering on liquid nitrogen; Neutron inelastic scattering on liquid ^{4}He. Most of the work has been related to the neutron inelastic scattering experiments on liquid nitrogen. (Auth.).

3511 **(INIS-mf—7170) Elaboration of a computer code for the solution of a two-dimensional two-energy group diffusion problem using the matrix response method.** Alvarenga, M.A.B. (Rio de Janeiro Univ. (Brazil). Coordenacao dos Programas de Pos-graduacao de Engenharia). Dec 1980. 237p. (In Portuguese). NTIS (US Sales Only), PC A11/MF A01. Order Number DE83780029.

Thesis.

An analytical procedure to solve the neutron diffusion equation in two dimensions and two energy groups was developed. The response matrix method was used coupled with an expansion of the neutron flux in finite Fourier series. A computer code 'MRF2D' was elaborated to implement the above mentioned procedure for PWR reactor core calculations. Different core symmetry options are allowed by the code, which is also flexible enough to allow for improvements by means of algorithm optimization. The code performance was compared with a corner mesh finite difference code named TVEDIM by using a International Atomic Energy Agency (IAEA) standard problem. Computer processing time 12,7% smaller is required by the MRF2D code to reach the same precision on criticality eigenvalue. (Author).

3512 **(INIS-mf—7187) X-ray and neutron scattering experiments on liquid chloroform for determining the molecule pair distribution function.** Leicht, D. (Karlsruhe Univ. (TH) (Germany, F.R.). Fakultaet fuer Chemie). 28 Apr 1978. 125p. (In German). NTIS (US Sales Only), PC A06/MF A01. Order Number DE82780809.

Thesis.

In the hydro carboxylation/reaction, which first has been studied by Reppe, olefine and acetylene compounds are processed with carbon monoxide and water at high pressures and high temperatures in the presence of metal carbonyls. This reaction can be enhanced considerably by application of ionizing radiation. Lower pressures and in particular lower temperatures can be used if gamma irradiation is performed during carboxylation. For the experiments a mixture of buten-1 and buten-2 as well as pure buten-1 and pure buten-2 has been used to study the behaviour of these defines with respect to the isomerization of the reaction products and to the olefines not transformed in the reaction process. Replacing water, methanole has been used as a reaction component, thus obtaining directly the respective carbonyl acid esters, which can be analyzed quantitatively and qualitatively with respect to their isomeric composition by gaschromatography.

3513 (INIS-SU—109, pp 207-230) **Some applications of neutrons in science and technology.** Csikai, J. (Kossuth Lajos Tudomanyegyetem, Debrecen (Hungary). Kiserleti Fizikai Intezet). 1980. NTIS (US Sales Only), PC A15/MF A01.

From 5. national Soviet conference on neutron physics; Kiev, Ukrainian SSR (15 Sep 1980).

Various methods developed in the Institute of Experimental Physics, Debrecen, Hungary for the utilization of neutrons in different fields of sciences (solid state physics, paleosciences, analytical chemistry) and practice (reactor fuel assay, exploration of mineral resources, road-building) are surveyed.

3514 (INIS-SU—125, pp 543) **Fluctuations in electromagnetic shower absorbed energy.** Belousov, A.S.; Kitaev, D.F.; Malinovskij, E.I.; Samedov, V.V.; Stolyarova, E.L.; Usik, A.P. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3515 (INIS-SU—125, pp 548) **Calculation of energy spectra of scattered particles for solving applied problems.** Pucherov, N.N.; Chesnokova, T.D. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3516 (INIS-SU—125, pp 555) **Method for measuring the energy dependence of the stopping power.** Shorin, V.S.; Sosnin, A.N. 1982. (In Russian). Dep. NTIS (US Sales Only).

From 32. conference on nuclear spectroscopy and nuclear structure; Kiev, Ukrainian SSR (16 Mar 1982).

3517 **(IPEN-Inf—10) Method for solving the transport equation in multiregions using the P/sub N/ method.** Yamaguchi, M.; Maiorino, J.R. (Instituto de Pesquisas Energeticas e Nucleares, Sao Paulo (Brazil)). Nov 1981. 49p. (In Spanish). NTIS (US Sales Only), PC A03/MF A01. Order Number DE83900314.

Portions of document are illegible.

This work describes the MPN-1, which is a computer program made in FORTRAN IV. The MPN-1 uses P/sub N/ method to solve the one-speed, anisotropic linear steady-state transport equation in non-multiplying multiregions, slab geometry. The MPN-1 allows a maximum number of 12 regions, and maximum order of approximation, N = 15. Besides, the anisotropic scattering is treated by an expansion in Legendre polynomial up to maximum degree of L = 15. The boundary conditions used are: (I) free surface, (II) isotropic incidence, (III) cosine incidence ($a\mu$/sup α1/ + $b\mu$/sup α2/ + $c\mu$/sup α3/), (IV) monodirectional incidence (delta function), and (V) total reflection. The required inputs are: order of approximation P/sub N/, average number of secondary particles in each region, external sources, thickness of each region, coefficients in a Legendre expansion of the transfer function in each region, and type of boundary conditions at the boundaries. The outputs are: albedo, transmission factor, disadvantage factor, total and angular fluxes and current.

3518 **(JINR—R-17-81-651) Spontaneous radiation characteristics of planar channeled positrons through KCl, KBr and KI crystals.** Mikhalake, D.; Gavrilenko, G.M.; Fedyanin, V.K. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics). 1981. 14p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702992.

The spectrum and power of the spontaneous radiation of planar channeled positrons with energies 50 MeV, 1 and 10 GeV in KCl, KBr and KI crystals along crystallographic planes (111) are studied. The power of the monochromatic component of the radiation is analysed as a function of the incident angle of the positron beam with the crystal planes.

3519 (Juel-Conf—45, pp 97) **Neutron scattering at an intensity modulated neutron source.** Scherm, R. Oct 1981. NTIS (US Sales Only), PC A99/MF A01.

From 5. meeting of the international collaboration on advanced neutron sources; Julich, F.R. Germany (22 Jun 1981).

3520 (Juel-Conf—45, pp 113-132) **Application of intense beams of positive pions and muons in solid-state physics.** Seeger, A. Oct 1981. NTIS (US Sales Only), PC A99/MF A01.

From 5. meeting of the international collaboration on advanced neutron sources; Julich, F.R. Germany (22 Jun 1981).

The present paper outlines the basic physics of positively charged pions and muons and of their behaviour in condensed matter. This behaviour may be studied by two quite different techniques, viz. lattice steering (channelling) of the positive muons (μ^+) resulting from the π^+ decay or of the relativistic positrons (e^+) resulting from the μ^+ decay, and muon spin rotation (μSR). Both π^+/μ^+ and μ^+/e^+ lattice steering have recently been demonstrated ex-

perimentally. The lattice-steering techniques have the advantage that they are universally applicable. With more intense μ^+ and π^+ beams of suitable time structure the time differential versions of the lattice-steering techniques are very promising for the study of crystal defects that can be decorated by π^+ and μ^+. μSR constitutes a well established technique based on the non-conversation of parity in Weak Interactions. It may be applied to a wide variety of materials with suitable magnetic properties. These include nuclear magnetism, ferro- and antiferromagnetism, spin polarization of conduction electrons, orbital magnetism of electrons in superconductors with non-homogeneous magnetic structures, and muonium atoms. So far the great majority of the μSR experiments were done in the so-called individual time-differential mode. When stronger beams with suitable time structures become available, resonance and collective-mode μSR methods will give access to problems that could not be investigated with the classical μSR methods.

3521 **(LA-UR—82-2688) DEPOS: parametric electron energy deposition module in slabs.** Lathrop, B.L.; Wienke, B.R. (Los Alamos National Lab., NM (USA)). 1982. Contract W-7405-ENG-36. 21p. (CONF-830304—1). NTIS, PC A02/MF A01. Order Number DE83000644.

Portions of document are illegible.

DEPOS is a code module that computes the energy deposition of monoenergetic fast electrons normally incident on a one dimensional slab absorber. The numerical algorithm is based on the highly accurate parametric fits of Tabata and Ito, valid for atomic number $5.3 \leqq Z \leqq B2$ and for kinetic energy 0.1 MeV $\leqq T \leqq 20$ MeV. Empirical equations developed for the extrapolated range and backscattering of electrons are utilized and bremsstrahlung production is included in the analysis. Adjustable parameters are least squares fit to experimental and Monte Carlo results and overall agreement is excellent.

3522 **(UCID—19583) Effect of resonance structure on 14-MeV Monte Carlo neutron transport in nitrogen and air.** Plechaty, E.F. (Lawrence Livermore National Lab., CA (USA)). 20 Oct 1982. Contract W-7405-ENG-48. 9p. NTIS, PC A02/MF A01. Order Number DE83001729.

The results of Monte Carlo calculations can be sensitive to methods used to treat cross sections. This sensitivity can be emphasized by studying one isotope of an element or material that has a resonance region. Very few naturally occurring materials exist in a mono-isotopic form, but when such a material is an important part of a problem, care should be exercised in the selection of a code to be used for the calculations. It is recommended that the ALICE code, that uses a multiband treatment for cross sections, be used at LLNL for neutronic and neutron-induced photonic problems.

3523 **Radiation from channeled leptons.** Swent, R.L.; Pantell, R.H. (Stanford Univ., CA (USA). Dept. of Electrical Engineering); Datz, S. (Oak Ridge National Lab., TN (USA)); Alguard, M.J. (Measurex Corp., Cupertino, CA (USA)); Berman, B.L.; Bloom, S.D.; Alvarez, R.; Hamilton, D.C. (California Univ., Livermore (USA). Lawrence Livermore Lab.). pp 861-869 of Physics of electronic and atomic collisions. Invited papers of the 12th international conference held at Gatlinburg, TN, USA, 15-21 July, 1981. Datz, S. (ed.). Amsterdam, Netherlands; North-Holland (1982).

From 12. IPEAC international conference on the physics of electronics and atomic collisions; Gatlinburg, TN, USA (15 Jul 1981).

High-energy charged particles, when incident upon a single crystal in a direction near a major crystallographic direction, can be scattered coherently by the crystal lattice. Low-mass particles emit radiation under these conditions, which is called channeling radiation. Quantum-mechanically, this radiation is described as arising from transitions between bound states in an averaged potential, which may be one- or two-dimensional. By observing the radiation, one can obtain information about the dynamics of the channeling process and about the crystals in which the channeling occurs.

3524 **(UCRL-Trans—11802) Effect of temperature on the production and recombination of the charge carriers in alpha-radiation columns.** Seitter, W. Translated from *Annalen der Physik (Leipzig)* ; 5: No. 34, 113-119(1939). Contract W-7405-ENG-48. 29p. NTIS, PC A03/MF A01. Order Number DE83000982.

Portions of document are illegible.

This study has undertaken to investigate the effect of increasing temperature on the conduction currents observable under specific geometric conditions in the particular - not simple - case of charge carrier formation by alpha radiation, in order to reach conclusions concerning the achievability of saturation, the maximum producible number of charge carriers, and the recombination conditions. In addition to the effect of temperature, the effects of the pressure and density of the gas and of the field conditions used then naturally had to be investigated also. 32 references, 13 figures.

6550 Medical Physics

REFER ALSO TO CITATION(S) 1805, 3075, 3086

3525 **(FRNC-TH—1065) Study of electron beams. Applications to computer calculation of isodoses in irradiated materials using high energy electrons.** Puel, G. (Toulouse-3 Univ., 31 (France)). Sep 1981. 151p. (In French). NTIS (US Sales Only), PC A08/MF A01. Order Number DE82780802.

Thesis.

Hitherto, no satisfactory solution has been found to the problem of calculating the dose distribution in materials irradiated by electron beams. We have therefore developed an experimental method by which the contribution to the dose due to electrons coming from points increasingly distant from the point of measurement can be estimated. Results for wide beams, together with those for smaller beams enable the dose distribution for complex fields to be calculated, allowing for irregularity of the irradiated surface. The block diagram is similar to that of the program CFIX used for photons. We have studied a wide range of electron energies (7 - 28 MeV). From our results we have derived an interpolative model enabling them to be used in relationship to beams of different energies after taking a minimum of measurements.

3526 **(INIS-mf—7155) Decree of 1 August 1981 on examinations for qualified experts and physicians authorised to undertake physical surveillance for protection against radiation.** 25 Aug 1981. 3p. (In Italian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83780021.

This Decree of the Minister of labour and Social Affairs of 1 August 1981 concerns the procedure for admission to examinations, for inclusion in the national list, of qualified experts and approved medical practitioners who are competent in radiation protection matters. the Decree replaces a former Decree of 24 June 1978 on the same subject.

3527 **(INIS-mf—7168) Development of an experimental method for the determination of the dose equivalent indices for low - and medium energy X- and gamma rays.** da Silva Estrada, J.J. (Centro Brasileiro de Pesquisas Fisicas, Rio de Janeiro). 1980. 92p. (In Portuguese). NTIS (US Sales Only), PC A05/MF A01. Order Number DE83780010.

Thesis.

An experimental method was developed to measure Dose Equivalent Indices for low and medium energy X-rays. A sphere was constructed to simulate the human body in accordance with ICRU Report 19 but using plexiglass instead of tissue equivalent material of density 1 $g.cm^{-3}$. Experimentally it was demonstrated that for the purpose of applied radiation protection both materials are equivalent in spite of a 18% higher density of plexiglass. CaF_2:Mn and LiF:Mg might be utilized to determine the absorbed dose distribution within the sphere. Measurements indicate that the effective energy can be determined with an accuracy better than 15% for the energy range under consideration. Depth dose curves measured with ionization chamber compared with those of LiF:Mg showed an agreement better than 12% and in the case of CaF_2:Mn better than 11% for all irradiation conditions used. Conversion fac-

tors in units rad R^{-1} measured with TLD and compared with those obtained from the literature based upon Monte Carlo calculation showed an agreement better than 23% for CaF_2:Mn and 19% for LiF:Mg. It is concluded from these experiments that the system plexiglass sphere-TLD dosimeters might be used to measure Dose Equivalent Indices for low and medium energy photons..

3528 (PNL—3736, pp 5.1-5.D.5) **Study 4: dose calculation algorithm upgrade analysis.** Hobbs, J.M.; Thorson, M.R.; Fix, J.J. Aug 1982. NTIS, PC A13/MF A01.

In Hanford personnel dosimeter supporting studies FY-1981.

A study of existing dose calculation algorithms and potential methods of upgrading the algorithms was conducted. Information available from routine calibration and check dosimeter results as well as results available from the DOE Technical Guidelines Program and the DOE Personnel Neutron Dosimeter Upgrade Program were included in the study.

3529 (PNL—3736, pp 6.1-6.A.7) **Study 5: energy response measurements.** Holbrook, K.L.; Yoder, R.C.; Holland, J.P.; Hooker, C.D. Aug 1982. NTIS, PC A13/MF A01.

In Hanford personnel dosimeter supporting studies FY-1981.

The response of the Hanford dosimeter to high energy capture gamma and nitrogen-16 beams was investigated along with the effect of high energy photon fields on the beta response. The penetrating and nonpenetrating dose response of the dosimeter to light- and medium-filtration x-ray techniques was compared to the delivered deep and shallow dose. Room return in the PNL neutron irradiation facilities was measured and correction factors for scatter were obtained.

6560 Solid State Physics

REFER ALSO TO CITATION(S) 2560, 3509, 3523

3530 (DESY—81-057) **2-dimensional O(4) symmetric Heisenberg ferromagnet in terms of rotation invariant variables.** Holtkamp, A. (Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany, F.R.)). Sep 1981. 7p. Dep. NTIS (US Sales Only), MF A01. Order Number DE82750230.

After introduction of rotation invariant auxiliary variables, the integration over all rotation variant variables (spins) in the 0(4) symmetric two-dimensional Heisenberg ferromagnet can be performed. The resulting new Hamiltonian involves a sum over closed loops. It is complex and invariant under U(1) gauge transformations. Ruehl's boson representation is used to derive the result.

3531 (KFKI—1982-54) **First-order transition for the (1+1)-dimensional q $\geqq$ 4 Potts model from finite-lattice extrapolation.** Igloi, F.; Solyom, J. (Hungarian Academy of Sciences, Budapest. Central Research Inst. for Physics). Jul 1981. 23p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83900361.

The (1+1)-dimensional Hamiltonian Potts model is studied for q $\geqq$ 4 using finite lattice extrapolation techniques. The ground state energy and its first derivative give information about the free energy and the latent heat of the classical 2-dimensional Potts model, while the gap in the excitation energy corresponds to the inverse of the correlation length. It is shown that the finite latent heat for q > 4, when the transition is of first-order, comes from the crossing of levels, nevertheless there are no excitations for which the gap would vanish in the thermodynamic limit, i.e. the correlation length is also finite.

6561 Superconductivity

REFER ALSO TO CITATION(S) 2551, 2568, 2636

3532 (JINR-R—8-81-613) **Determination of the upper critical magnetic fields from resistive measurements.** Vasilev, P.G.; Goncharov, I.N. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of High Energy). 1981. 11p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82703152.

The problem of determination of the upper critical magnetic fields of type-2 superconductors is discussed. Systematic resistive measurements data for thin foils of Nb-Ti alloys at various transport current densities, temperatures and orientations of the samples relatively to the applied magnetic field are presented. A selfconsistent method of determination of Hsub(c2) and Hsub(c3) taking into account microstructural peculiarities as well as bulk and surface pinning, is proposed.

6570 Theoretical Physics

REFER ALSO TO CITATION(S) 3879, 3888

3533 (BONN-HE—82-1) **Global symmetries of spin systems.** Rittenberg, V. (Bonn Univ. (Germany, F.R.). Physikalisches Inst.). Jan 1982. 13p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82750582.

It is the purpose of this talk to present an application of group theory in statistical mechanics and a related quantum mechanics problem.

3534 (DOE/ER/40048—82-PT8) **Gravity as a dynamical consequence of the strong, weak, and electromagnetic interactions.** Zee, A. (Washington Univ., Seattle (USA). Dept. of Physics). Dec 1981. Contract AC06-81ER40048. 17p. NTIS, PC A02/MF A01. Order Number DE82020190.

A coherent and reasonable account of gravitational physics is shown to be possible. The three non-gravitational interactions are described by a scale and conformal invariant and asymptotically free Yang-Mills theory with massless fermions. Conformal invariance is required so that the gravitational sector of the theory is given by the Weyl action. The theory is renormalizable and has a unitary S-matrix. Possible breakdown of causality is observable only at the Planck length. In this theory, Einstein's theory of gravity is induced as an effective long-distance theory. An R^2 term is also induced with a finite and physically desired sign. (GHT)

3535 (IPNO-TH—81-43) **Coupled adiabatic approximation in the three body problem.** Ballot, J.L.; Fabre de la Ripelle, M.; Levinger, J.S. (Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire). Nov 1981. 30p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE82702798.

In the framework of the hyperspherical formalism, we present a study of the Coupled Adiabatic Approximation (CAA) for the case of three nucleons interacting via central spin-dependent two-body potentials. We analyse the convergence of the ground state eigenvalues versus the grand orbital quantum number (2K) and compare the results to that of the Coupled Equations (CE). We also compare with two simpler but less accurate approximations: the Uncoupled Adiabatic Approximation (UAA) and the Extreme Adiabatic Approximation (EAA). The former provides an upper and the latter provides a lower bound to the ground state energy.

3536 (ITEP—17(1982)) **Complete system of equations for the state vector of a relativistic composite system on the light front.** Karmanov, V.A. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Teoreticheskoj i Ehksperimental'noj Fiziki). 1982. 23p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702978.

The state vector, defined on the invariant light-front hypersurface $\omega x=0$ ($\omega^2=0$) is considered. The equation describing the state vector dependence on four-dimensional rotations of the light-front hypersurface is obtained. This equation complements the Schroedinger equation and removes the ambiguities in calculating the wave functions of relativistic composite systems (in particular in

Weinberg equation in the case of non-zero total angular momentum).

3537 **(JINR—E4-82-273) Standardization of coordinating signals.** Nikolenko, V.G. (Joint Inst. for Nuclear Research, Dubna (USSR)). 1982. 14p. Joint Inst. for Nuclear Research, Dubna, USSR.

The discussed standard of the electromagnetic signal (γ) together with the standard clock enable the measurement of space coordinates as well as of time coordinates. The standards using the rigid rods and the interference of the electromagnetic wave (EMW) are considered in comparison with the standard of length taken from this basis. The standards both of frequency and of length and their interrelations are discussed. The possible kinematical measuring operations with EMW are considered without the convention of light velocity isotropy (convention of simultaneity of the remoted events). The refractive index, the phase velocity, the wavelength of EMW out of the frequency range of γ-signals, can be measured only with the help of γ-signals. Some principal experiments which established the properties of EMW are discussed.

3538 **(LA—9516-MS) Dimensionless equation of state for condensed media: numerical results for shock heating and for flow deflection by an oblique stationary shock.** Walsh, J.M. (Los Alamos National Lab., NM (USA)). Sep 1982. Contract W-7405-ENG-36. 20p. NTIS, PC A02/MF A01. Order Number DE83002308.

A dimensionless equation-of-state formulation causes the solutions to a few standard problems in shock hydrodynamics to be somewhat more general than usual. Calculated results are given for shock heating and for the important problem of flow deflection by an oblique shock. The results will be useful on occasion because they can be applied without having to resort to extensive calculations for each new application.

3539 **(LA-UR—82-2791) Two-dimensional modeling of multiply scattered laser radiation in optically dense aerosols.** Zardecki, A.; Gerstl, S.A.W.; Embury, J.F. (Los Alamos National Lab., NM (USA); Army Armament Research and Development Command, Aberdeen Proving Ground, MD (USA). Chemical Systems Lab.). 1982. Contract W-7405-ENG-36. 14p. (CONF-8206121—1). NTIS, PC A02/MF A01. Order Number DE83000607.

From CSL conference on obscuration and aerosol research; Aberdeen, MD, USA (21 Jun 1982).

Portions of document are illegible.

The discrete ordinates finite element radiation transport code TWOTRAN is applied to describe the multiple scattering of a laser beam from a reflecting target. For a model scenario involving a 99% relative humidity rural aerosol, we compute the average intensity of the scattered radiation and correction factors to the Lambert-Beer law arising from multiple scattering. As our results indicate, two-dimensional x-y and r-z geometry modeling can reliably describe a realistic three-dimensional scenario. Specific results are presented for the two visual ranges of 1.52 and 0.76 km which show that for sufficiently high aerosol concentrations (e.g., equivalent to V = 0.76 km) the target signature in a distant detector becomes dominated by multiply scattered radiation from interactions of the laser light with the aerosol environment.

3540 **(ORNL/TM—8451) Scattering of a plane electromagnetic wave by a conducting circular cylinder.** Chu, Y.T. (Oak Ridge National Lab., TN (USA)). Oct 1982. Contract W-7405-ENG-26. 158p. NTIS, PC A08/MF A01. Order Number DE83001682.

Thesis. Submitted to Univ. of Tennessee, Knoxville.

The uniform asymptotic solution of light scattering from a conducting circular cylinder at oblique incidence is derived by using the Watson transformation method. It clearly demonstrates that the major contributions of the total field are the Fresnel integrals in the transition regions, the creeping waves in the shadow region, and the incident wave and the reflected wave in the lighted region. The creeping wave is excited by the incident ray tangential to the surface of the cylinder, and it creeps further into the shadow region. The creeping wave can radiate energy tangentially away from the curved surface; hence it is a damped periodic wave. A He-Ne laser was used as a light source, and the conducting cylinder was an aluminum-coated quartz fiber. The positions of intensity maxima and minima of the scattered light predicted by the uniform asymptotic solution were in good agreement with experiment. Although the uniform asymptotic solution is derived under the assumptions of high frequency and large radius, it still gives good results at relatively low frequencies, where the ratio of the radius to the wavelength is of the order unity. The uniform asymptotic solution has the advantages of simplifying the numerical calculation and of giving a physical model of the exact solution.

3541 (INIS-mf—7127, pp 45) **Plasma diagnostics by Moire deflectometry.** Margalith, E.; Kafri, O. (Israel Atomic Energy Commission, Beersheba. Nuclear Research Center-Negev). [nd]. NTIS (US Sales Only), PC A04/MF A01.

From Workshop on plasma chemistry in technology; Ashkelon, Israel (30 Mar 1981).

6580 Mathematical Physics

3542 **(JINR—E-2-81-801) Renormalization group, principle of invariance and functional automodelity.** Shirkov, D.V. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics). 1981. 8p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702984.

There exists a remarkable identity of functional equations describing the property of functional automodelity in diverse branches of physics: renormalization group equations in quantum field theory, functional equations of the invariance principle of the one-dimensional transport theory and some others. The origin of this identity is investigated. It is shown that the structure of these equations reflects the simple and general property of transitivity with respect to the way of fixatio of initial on effective degrees of freedom.

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3543 **(DOE/ER—0148) Advanced Fusion Concepts project summaries, FY 1982.** (Department of Energy, Washington, DC (USA). Div. of Applied Plasma Physics). Oct 1982. 94p. NTIS, PC A05/MF A01. Order Number DE83001803.

This report contains descriptions of the activities of all the projects supported by the Advanced Fusion Concepts Branch of the Office of Fusion Energy, U.S. Department of Energy. These descriptions are project summaries of each of the individual projects, and contain the following: title, principle investigators, funding levels, purpose, approach, progress, plans, milestones, graduate students, graduates, other professional staff, and recent publications.

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REFER ALSO TO CITATION(S) 3801, 3825

3544 **(AD-A—111910/6) Multi-component model of the resistive hose instability.** Sharp, W.M.; Lampe, M.; Uhm, H.S. (Naval Research Lab., Washington, DC (USA)). 4 Mar 1982. 70p. (NRL-MR—4753). NTIS, PC A04/MF A01.

A new model of beam dynamics is presented for treating the resistive hose instability in intense, self-pinched electron or ion beams. The beam is modeled as a superposition of rigid, independently-moving components with different radii. This multi-component model exhibits the localized resonances and other analytic properties of a Vlasov treatment. The new model is used to calculate the eigenfunctions and the dispersion relation for hose instability of an axially uniform beam propagating in a medium of specified conductivity profile with any specified return current. Wave growth is found to be significantly increased by return current or by a narrow conductivity profile. The results are compared to those of earlier models.

3545 **(AD-A—111911/4) Return-current-driven instabilities of propagating electron beams.** Uhm, H.S.; Lampe, M. (Naval Research Lab., Washington, DC (USA)). 5 Mar 1982. 33p. (NRL-MR—4767). NTIS, PC A03/MF A01.

A stability analysis is performed for the first nine transverse modes (azimuthal mode number plus radial mode number < or = 3) of a self-pinched relativistic electron beam propagating in a collisional plasma. Only frequencies omega in the range omega tau sub d << 1 are considered, where tau sub d is the dipole magnetic decay length. For such modes, the presence of plasma return current is the only destabilizing mechanism. Paraxial flow, space charge neutrality, and a flat radial profile of beam density are also assumed. Within these limitations an exact analysis of the linearized Vlasov stability problem is carried out in closed form. For each mode, the instability threshold, growth rate, and conditions for oscillatory vs. pure growth are determined. For beams with a moderate return current fraction, the hose, sausage and axial hollowing modes appear to be particularly dangerous.

3546 **(CONF-8205118—) Report of planning workshop on fluctuations and anomalous transport in tokamaks.** (Department of Energy, Washington, DC (USA). Office of Fusion Energy; Maryland Univ., College Park (USA)). Oct 1982. 30p. NTIS, PC A03/MF A01. Order Number DE83001154.

From Workshop on fluctuation and anomalous transport to tokamaks; College Park, MD, USA (7 May 1981).

The workshop was divided into three sections: review of experiments on fluctuations in tokamaks, review of theories of anomalous transport, and discussion of directions for future research and experimental/theoretical collaboration. Each session was assigned a recording secretary to take notes which were used in preparing this report. The report includes the activities, conclusions, and recommendations of the workshop.

3547 **(DOE/ER/10376—T2) Studies of autoionizing states relevant to dielectronic recombination. Final report.** Gallagher, T.F. (SRI International, Menlo Park, CA (USA)). 24 Sep 1982. Contract AT03-79ER10376. 36p. NTIS, PC A03/MF A01. Order Number DE83000669.

Dielectronic recombination, the inverse of autoionization, is a mechanism that causes significant power loss in CTR plasmas. While it is thought that dielectronic recombination proceeds via autoionizing Rydberg states, very few data exist on autoionizing states and how they are affected by conditions found in a CTR plasma. Under this research program we have been using a novel laser excitation technique developed at SRI to study autoionizing states and the perturbing effects of electric fields found in CTR plasmas. We describe experimental investigations of the spectroscopy of autoionizing Rydberg states, the energy analysis of electrons ejected from autoionizing states, autoionizing in electric fields, and the autoionization induced by an electric field.

3548 **(DOE/ER/53132—1) Computer simulation of lower-hybrid heating and current drive in tokamaks. Progress report, July 1, 1982-September 1, 1982.** Ogden, J.M. (Ogden (Joan M.), Princeton, NJ (USA)). Sep 1982. Contract AC02-82ER53132. 34p. NTIS, PC A03/MF A01. Order Number DE83000229.

Recent experiments have shown that radiofrequency waves near the lower hybrid frequency can be used effectively for tokamak current drive and heating. Our research involves upgrading the models of lower hybrid current drive and heating used in the PPPL 1-D tokamak transport codes BALDUR and TRANSP, and applying the codes to analysis of the PLT experiments and to reactor studies. The initial stages of the work have been completed and are described in this report. Two main tasks were performed. First, an improved physical model was synthesized from a survey of recent theoretical and experimental results. The second task was to design interfaces between an existing ray tracing code and the transport codes. The necessary flow of information between programs was charted, and input and output formats were devised.

3549 **(DOE/ER/53136—1) Theoretical aspects of mirror fusion. Progress report, 1 July 1982-30 September 1982.** Knorr, G.E.; Nicholson, D.R. (Iowa Univ., Iowa City (USA). Dept. of Physics and Astronomy). Sep 1982. Contract AC02-82ER53136. 7p. NTIS, PC A02/MF A01. Order Number DE83000289.

Summaries of research during this period are given for the following: (1) streaming of plasma out of a magnetic mirror, and (2) parametric instabilities during electron cyclotron resonance heating of tandem mirrors. (MOW)

3550 **(DOE/ER/53140—3) Monte Carlo studies of ICRF in tandem mirrors.** Todd, A.M.M. (Grumman Aerospace Corp., Princeton, NJ (USA)). 1982. Contract AC02-82ER53140. 4p. (CONF-821103—24). NTIS, PC A02/MF A01. Order Number DE83001648.

From American Nuclear Society winter meeting; Washington, DC, USA (14 Nov 1982).

Tandem Mirror Fusion Reactor concepts consist of a central solenoid surrounded by a blanket in which the bulk of the reacting plasma is contained. Electrostatic confinement of the bulk plasma ions and plasma stability is providd by complex mirror plugs at each end of the solenoid. In the TARA mode, named for a device under construction at MIT, each end plug consists of a strong axisymmetric mirror, a thermal barrier driven by neutral beams and Electron Cyclotron Resonance Heating (ECRH) whose function is to isolate central cell and anchor electrons, and an MHD anchor which supplies gross plasma stability, and in which the confining electrostatic potential is created by neutral beam injection (NBI).

3551 **(DOE/ET/51013—58) Electron-cyclotron heating in the Constance 2 mirror experiment.** Mauel, M.E. (Massachusetts Inst. of Tech., Cambridge (USA). Plasma Fusion Center). Sep 1982. Contract AC02-78ET51013. 153p. NTIS, PC A08/MF A01. Order Number DE83001003.

Thesis. Portions of document are illegible.

Electron cyclotron heating of a highly-ionized plasma in mirror geometry is investigated. The experimental diagnosis of the electron energy distribution and the comparison of the results of this diagnosis with a two dimensional, time-dependent Fokker-Planck simulation are accomplished in four steps. (1) First, the power balance of the heated and unheated Constance 2 plasma is analyzed experimentally. It is concluded that the heated electrons escape the mirror at a rate dominated by a combination of the influx of cool electrons from outside the mirror and the increased loss rate of the ions. (2) The microwave parameters at the resonance zones are then calculated by cold-plasma ray tracing. High N/sub parallel/ waves are launched and for these waves, strong first-pass absorption is predicted. The absorption strength is qualitatively checked in the experiment by surrounding the plasma with non-reflecting liners. (3) A simplified quasilinear theory including the effect of N/sub parallel/ is developed to model the electrons. An analytic expression is derived for the RF-induced pump-out of the magnetically-confined warm electrons. Results of the Fokker-Planck simulations show the development of the electron energy distribution for several plasma conditions and verify the scaling of the analytic expression for RF-induced diffusion into the loss cone. (4) Sample x-ray and endloss data are presented, and the overall comparison between the simulation and experiment is discussed. The x-ray signals indicate that, for greater RF power, the hot electrondensity increases more rapidly than its temperature. The time history of the endloss data, illustrating RF-enhancement, suggests the predicted scaling for warm-electron pump-out. Finally, a comparison between the measured and predicted energy distribution shows that the bulk, warm and hot components of the heated Constance 2 electrons are indeed reproduced by the simulation.

3552 **(DOE/ET/53034—64) Numerical and analytical investigation of nonlinear properties of plasmas and experimental studies of cusp confinement and of CTR plasmas. Progress report (theory part), 1 May 1981-30 April 1982.** Knorr, G.E. (Iowa Univ., Iowa City (USA). Dept. of Physics and Astronomy). 1982. Contract AC02-76ET53034. 12p. NTIS, PC A02/MF A01. Order Number DE83001371.

A listing of work published during this report period is given. (MOW)

3553 **(DOE/ET/53041—14) Computer simulation of kinetic properties of plasmas. Final report.** Denavit, J. (Northwestern Univ., Evanston, IL (USA)). Aug 1982. Contract AC02-76ET53041. 15p. NTIS, PC A02/MF A01. Order Number DE83000236.

The research was directed toward the development and testing of new numerical methods for particle and hybrid simulation of plasmas, and their application to physical problems of current significance to Magnetic Fusion Energy. This project will terminate on August 31, 1982 and this Final Report describes: (1) the research accomplished since the last renewal on October 1, 1981; and (2) a perspective of the work done since the beginning of the project in February 1972.

3554 **(DOE/ET/53088—35) Drift-wave turbulence and anomalous transport.** Horton, W. (Texas Univ., Austin (USA). Inst. for Fusion Studies). Sep 1981. Contract FG05-80ET53088. 150p. (IFSR—35). NTIS, PC A07/MF A01. Order Number DE83000118.

A detailed analysis is given for each of the following chapters: (1) anomalous transport due to drift modes at low plasma pressure, (2) drift wave fluctuation spectra, and (3) anomalous transport from electromagnetic fluctuations. (MOW)

3555 **(DOE/ET/53088—68) Implicit-particle simulation of magnetized plasmas.** Barnes, D.C.; Kamimura, T.; Leboeuf, J.N.; Tajima, T. (Texas Univ., Austin (USA). Inst. for Fusion Studies). Sep 1982. Contract FG05-80ET53088. 54p. NTIS, PC A04/MF A01. Order Number DE83001609.

Portions of document are illegible.

A second-order accurate, direct method for the simulation of magnetized, multi-dimensional plasmas is developed. A time decentered particle push is combined with the direct method for implicit plasma simulation to include finite sized particle effects in an absolutely stable algorithm. A simple iteration (renormalized Poisson equation) is used to solve the field corrector equation. Details of the two-dimensional, electrostatic, constant magnetic field, periodic case are given. Numerical results for ion-acoustic fluctuations and for an unstable gravitational interchange confirm the accuracy and efficacy of the method applied to low-frequency plasma phenomena.

3556 (EUR—7425(pt.2), pp 631-639) **Alfven wave heating.** Stix, H. (Princeton University, New Jersey (USA)). 1981. NTIS (US Sales Only), PC A25/MF A01.

From 2. joint Grenoble-Varenna international symposium on heating in toroidal plasmas; Como, Italy (3 Sep 1980).

The physics of Alfven-wave heating is particularly sensitive to the character of the linear mode conversion which occurs at the Alfven resonance layer. Parameter changes can profoundly affect both the location within the plasma and the mechanism for the power absorption. Under optimal conditions the heating power may be absorbed by electron Landau damping and by electron transit-time magnetic pumping in the plasma interior, or by the same processes acting near the resonance layer on the mode-converted kinetic Alfven wave. The method is outlined for computing the coefficients for reflection, transmission and absorption at the resonance layer and some representative results are offered.

3557 (EUR—7425(pt.2), pp 641-642) **Low-frequency heating revisited.** Canobbio, E. (EURATOM-CEA Association, Grenoble (France)). 1981. NTIS (US Sales Only), PC A25/MF A01.

From 2. joint Grenoble-Varenna international symposium on heating in toroidal plasmas; Como, Italy (3 Sep 1980).

Published in summary form only.

3558 (EUR—7425(pt.2), pp 643-654) **Resonant absorption of Alfven waves in fat tori with circular cross-section.** Appert, K.; Balet, B.; Gruber, R.; Troyon, F.; Tsunematsu, T.; Vaclavik, J. (EURATOM-SUISSE Association CRPP, Lausanne (Suisse)). 1981. NTIS (US Sales Only), PC A25/MF A01.

From 2. joint Grenoble-Varenna international symposium on heating in toroidal plasmas; Como, Italy (3 Sep 1980).

The heating of toroidal plasmas by resonant absorption of Alfven waves is considered in the framework of ideal MHD. We show that the overall picture of Alfven wave heating in a fat torus does not fundamentally differ from that in a cylinder. The toroidal plasma may efficiently be heated internally when a collective mode is excited. The main toroidal effects are a shift of the resonant surface towards the plasma centre and an increased reactive power which shows up as enhanced motion near the plasma edge.

3559 (EUR—7425(pt.2), pp 655-661) **Theory of Alfven wave heating in general toroidal geometry.** Tataronis, J.A.; Salat, A. (EURATOM-IPP Association, Garching (Federal Republic of Germany)). 1981. NTIS (US Sales Only), PC A25/MF A01.

From 2. joint Grenoble-Varenna international symposium on heating in toroidal plasmas; Como, Italy (3 Sep 1980).

The purpose of this paper is to present a general treatment of Alfven wave heating based on the linearized equations of ideal magnetohydrodynamics (MHD). The conclusion of this study is that the geometry of the plasma equilibrium could play an important role on the effectiveness of this heating mechanism, and for certain geometries the fundamental equations may not possess solutions which satisfy prescribed boundary conditions.

3560 (EUR—7425(pt.2), pp 663-669) **Magnetosonic wave heating of high beta plasmas.** Nozaki, K.; Fried, B.D.; Morales, G.J. (University of California, Los Angeles (USA)). 1981. NTIS (US Sales Only), PC A25/MF A01.

From 2. joint Grenoble-Varenna international symposium on heating in toroidal plasmas; Como, Italy (3 Sep 1980).

The use of Alfven wave heating for minimum-average-B configurations, such as multipole or multipole-mirror configurations, requires an understanding of the effects of high β and nonlinear phenomena on the coupling of energy to the plasma. Using linearized ideal MHD theory to evaluate the high β effects, we calculate the ratio of energy transferred to the plasma interior to that absorbed at the Alfven resonant layer, taking as a specific example the UCLA LAMEX (Large Mirror Ratio Experiment) in which multipole rings stabilize an axisymmetric simple mirror. Of the various nonlinear effects in such configurations, we find the most important one to be the triggering of ballooning instabilities due to the ponderomotive force arising from the kinetic Alfven wave in the resonant region. This sets a limit on the power which can be used for Alfven wave heating.

3561 (EUR—7425(pt.2), pp 671-676) **Faraday shielding of surface dissipation effects in Alfven wave heating.** Puri, S. (EURATOM-IPP Association, Garching (Federal Republic of Germany)). 1981. NTIS (US Sales Only), PC A25/MF A01.

From 2. joint Grenoble-Varenna international symposium on heating in toroidal plasmas; Como, Italy (3 Sep 1980).

The self-consistent boundary value solutions for the Alfven wave heating is obtained with a model that includes the pertinent kinetic effects. It is found that the otherwise encouraging performance of the finite ky=(minor plasma radius)$^{-1}$ case corresponding to the cylindrical m=1 mode is accompanied by significant (> or approximately 10%) coupling directly from the antenna to the shear wave. The shear wave energy is rapidly absorbed by the electrons via Landau damping close to the plasma boundary. In this paper we report on the effectiveness of the Faraday shield in the practically complete suppression of the surface shear mode excitation accompanied by an absence of the undesirable surface heating effects. Antenna parameters for the flattened (slab geometry) ZEPHYR machine are presented. Finally, it is suggested that in view of the insensitiveness of Alfven wave heating scheme to the electron temperature, this method could be used for building up a hot plasma from an initial cold filling with application to net current free devices.

3562 (EUR—7425(pt.2), pp 677-682) **Alfven wave structure and resonant dissipation in cylindrical stability and heating problems.** Fiori, C. (Universite de Grenoble 1 (France)). 1981. NTIS (US Sales Only), PC A25/MF A01.

From 2. joint Grenoble-Varenna international symposium on heating in toroidal plasmas; Como, Italy (3 Sep 1980).

For 'ω'approximately equal to epsilonsup(1/3)tausub(A)sup(-1), we obtain the general solution of the resistive differential equation for the radial M.H.D. displacement in cylindrical geometry, under the assumption of incompressibility. Here: ω is the wave frequency. By using a flux function, we write the expression of the electromagnetic field and current density in the resistive layer. Finally, we discuss power dissipated in this layer by an external wave and the limit when the resistivity vanishes.

3563 (EUR—7425(pt.2), pp 683-688) **High frequency plasma heating in Tokamaks within the Alfven frequency range.** Elfimov, A.G. (Physico-Technical Institute of the USSR, Sukhumi (USSR)). 1981. NTIS (US Sales Only), PC A25/MF A01.

From 2. joint Grenoble-Varenna international symposium on heating in toroidal plasmas; Como, Italy (3 Sep 1980).

The present paper deals with investigations on HF fields generated by an external helical circuit within the Alfven frequency range (OMEGA<ωsub(Bi)) and absorbed in a plasma cylinder with a constant magnetic field. The investigations are performed using the dielectric constant tensor. Stationary distributions of HF field amplitudes are found from the radius with parabolically distributed densities. It is shown that in the vicinity of a local Alfven resonance r=rsub(e) (rsub(e) is the radius with the condition OMEGA=ksub(z)csub(A)met). The HF field generated by the circuit is converted into a short wavelength Alfven mode and a fast magnetic sound wave field. Resonant conditions are defined for which the short wavelength Alfven mode amplitudes reaches the maximum, and can exceed the vacuum field amplitude by one order of magnitude. The power absorbed is estimated for plasma parameters close to the thermonuclear values intended to meet the conditions in tokamak-type machines. Plasma heating up to thermonuclear parameters is ensured by absorption of the short wavelength Alfven mode as a result of Landau electron damping for HF field amplitudes of Hphi approximately equal to 100 Oe at the plasma boundary during approximately 20 ms.

3564 (EUR—7425(pt.2), pp 689-692) **HF field structures in a plasma heated by Alfven waves in the R-O Stellarator.** Kirov, A.G.; Ruchko, L.F.; Sukachov, A.V. (Physico-Technical Institute of the USSR, Sukhumi (USSR)). 1981. NTIS (US Sales Only), PC A25/MF A01.

From 2. joint Grenoble-Varenna international symposium on heating in toroidal plasmas; Como, Italy (3 Sep 1980).

The results of experiments investigating HF electric and magnetic field structures excited in a plasma are presented for HF heating within the OMEGA<ωsub(Bi) frequency range. The effect of the type of HF field radial distributions on heating efficiency has been studied.

3565 (EUR—7425(pt.2), pp 693-698) **Probe measurements of the magnetic field structure of fast wave toroidal eigenmodes.** Coleman, P.D.; Kristiansen, M.; Hagler, M.O. (Texas Tech. University, Lubbock (USA)); Blackwell, B.D. (Francis Bitter Magnet Laboratory, Cambridge, Massachusetts (USA)). 1981. NTIS (US Sales Only), PC A25/MF A01.

From 2. joint Grenoble-Varenna international symposium on heating in toroidal plasmas; Como, Italy (3 Sep 1980).

Detailed magnetic probe measurements of fast Alfven wave toroidal eigenmodes have been made in the Texas Tech Tokamak. Differential magnetic loop probes served as the principal diagnostic technique in measuring: the azimuthal variation of the eigenmode fields, the frequency vs density curves for the occurence of the eigenmodes, and the radial profiles of the bsub(z) and bsub(theta) magnetic fields.

3566 (EUR—7425(pt.2), pp 701-710) **Neutral beam heating results on PLT and PDX.** Eubank, H.P.; Grisham, L.R.; Kozub, T.A. (Princeton University, New Jersey (USA)). 1981. NTIS (US Sales Only), PC A25/MF A01.

From 2. joint Grenoble-Varenna international symposium on heating in toroidal plasmas; Como, Italy (3 Sep 1980).

A summary of PLT neutral beams results for the period 1978-1979 is presented. Included are: neutron spectral shapes for D^0, D^+ and H^0, D^+ and comparisons of calculated and observed D^0, D^+ intensities; rotational effects of unbalanced toroidal momentum input and ion and electron heating results, including possible ripple, effects, for this period. In addition, we report preliminary neutral beam heating results for PDX.

3567 (EUR—7425(pt.2), pp 711-721) **Confinement studies during neutral beam injection in PLT.** Goldston, R.; Davis, S.; Eubank, H. (Princeton University, New Jersey (USA)). 1981. NTIS (US Sales Only), PC A25/MF A01.

From 2. joint Grenoble-Varenna international symposium on heating in toroidal plasmas; Como, Italy (3 Sep 1980).

Electron energy confinement studies in PLT have given intriguing results. At low densities and high temperatures we find an improvement in central electron energy containment, while the gross electron energy confinement is approximately constant. At the highest power levels this regime is now accessible, however, due to increased central core radiation. A recent scan of electron heating as a function of plasma density using D^0 beams shows that in the moderate temperature and density range for PLT little degradation of heating efficiency occurs as the plasma density increases and beam penetration is reduced. The electron heating, moreover, is found to be linear with respect to the input beam power, up to the presently achieved limits of Psub(b) (H^0) approximately 2.0 MW and Psub(b)(D^0) approximately 3.0 MW.

3568 (EUR—7425(pt.2), pp 745-759) **High beta studies on ISX-B with neutral beam injection.** Sheffield, J.; Bates, S.C.; Bush, C.E. (Oak Ridge National Laboratory, Tennessee (USA)). 1981. NTIS (US Sales Only), PC A25/MF A01.

From 2. joint Grenoble-Varenna international symposium on heating in toroidal plasmas; Como, Italy (3 Sep 1980).

Injection of H^0 into D^+ plasmas with beam power Psub(b) of up to 1.7 MW has produced rms betas of approximately 4%, volume-averaged betas of approximately 3%, and central betas of approximately 10% in the ISX-B tokamak. Although theoretical calculations indicate that the observed equilibria may be unstable to ballooning modes, no catastrophic loss of confinement has been observed, and beta continues to increase with injection power. In these beam-dominated high-beta discharges the electron and ion energy confinement times are still similar to those obtained with ohmic heating: ion energy confinement is neoclassical within a factor of approximately 2, and electron energy confinement follows the usual Alcator scaling. In high-power injection discharges the character of the magnetohydrodynamic (MHD) behavior changes, the particle confinement time decreases, and the inward impurity transport appears to be inhibited. These effects, however, may not be linked directly to beta.

3569 (EUR—7425(pt.2), pp 761-774) **Beam-heating research at the I.V. Kurchatov Institute.** Mukhovatov, V.S. (I.V. Kurchatov Institute of Atomic Energy, Moscow (USSR)). 1981. NTIS (US Sales Only), PC A25/MF A01.

From 2. joint Grenoble-Varenna international symposium on heating in toroidal plasmas; Como, Italy (3 Sep 1980).

This paper contains a review of the results obtained on the T-11 tokamak with neutral beam injection. In recent experiments, the injection of approximately 0.6 MW H^0-beams into D^+-plasmas has produced volume-averaged beta values (βT) of 2-2.5% and central beta values βT (0) of approximately 9%. It was shown that the increase in (βT) up to approximately 2% did not deteriorate the plasma energy confinement. Experimental pressure profiles were examined with respect to stability criteria for high-n ballooning modes and were found to be stable (except a narrow central region) up to a (βT) of 3-3.5%. Phenomena related to the beam injection such as distortion of ion energy spectra, toroidal plasma rotation, and a beam-induced current are discussed. The future plans of beam-heating research at the Kurchatov Institute are presented.

3570 (EUR—7425(pt.2), pp 775-788) **Results of neutral beam injection in DITE Tokamak.** Hugill, J. (EURATOM-UKAEA Association, Abingdon, Oxon (United Kingdom)). 1981. NTIS (US Sales Only), PC A25/MF A01.

From 2. joint Grenoble-Varenna international symposium on heating in toroidal plasmas; Como, Italy (3 Sep 1980).

The fast ions interact classically with the target plasma for GAMMA<=4. The beam driven current has been measured at levels up to 40% of the total plasma current. Enhanced radiation due to charge exchange neutralization of impurities has been observed. The effects on the electron power balance are somewhat variable but usually beneficial, allowing an extension of the region for stable operation in I versus n parameter space, and interesting values of β. Ion power balance and the increase of plasma density with neutral beam injection have been examined.

3571 (EUR—7425(pt.2), pp 789-815) **Neutral beam heating in W VII-A Stellarator.** Bartlett, D.V.; Cannici, G.; Cattanei, G. (EURATOM-IPP Association, Garching (Federal Republic of Germany)). 1981. NTIS (US Sales Only), PC A25/MF A01.

From 2. joint Grenoble-Varenna international symposium on heating in toroidal plasmas; Como, Italy (3 Sep 1980).

A high density current-free deuterium plasma with $\beta(o)<=0{,}5\%$, nsub(e)(o)>=10^{14} cm^{-3}, Tsub(e), Tsub(i)>350 eV can be maintained in W VII A stellarator by injection of 600 kW of H^0 at 27 kV. The plasma energy content rises linearly with power, and in first experiments with 1.1 MW of neutral power 3.5 kJ have been achieved. The plasma shows no major instabilities but the energy balance is dominated by radiation losses, which are attributed to an increase of impurity ions in the plasma center, predominantly oxygen. The observed heating efficiency in particular for the plasma ions, seems to be higher than predicted by the beam deposition code. Possible mechanisms for this are discussed. It appears that radial electric fields as low as kTsub(e)/a improve the computed efficiency as well as the ion heating considerably. Despite the uncertainty about actual input power, it can be shown that the plasma confinement improves during injection.

3572 (EUR—7425(pt.2), pp 849-855) **Neutral injection heating of ohmic and currentless plasmas in the CLEO stellarator.** Lomas, P.J.; Johnson, P.C.; Lees, D.J.; Thomas, P.R. (EURATOM-UKAEA Association, Abingdon, Oxon (United Kingdom)). 1981. NTIS (US Sales Only), PC A25/MF A01.

From 2. joint Grenoble-Varenna international symposium on heating in toroidal plasmas; Como, Italy (3 Sep 1980).

The CLEO neutral injection system delivers up to 150 kW of neutrals tangentially to the torus. Substantial electron and ion heating is observed on injection into low current ohmic discharges where the vacuum fields dominate the rotational transform. At moderate densities nsub(e) approximately 210^{19} m^{-3}, a power input < or approximately 70 kW to fast confined ions will double Tsub(e) and Tsub(i). Tsub(e) approximately 320 eV and Tsub(i) approximately 300 eV are reached. Gas puffing during injection has allowed densities up to nsub(e) approximately 10^{20} m^{-3} and peak beta values βsub(T) approximately 0.75% to be achieved and sustained. The data for injection into ohmic discharges is consistent with a one-dimensional transport model. Hot plasmas are not sustained if the ohmic current is turned off during the injection pulse, nor achieved by injecting into a cold currentless target plasma. Typical currentless plasmas sustained by neutral injection have parameters < nsub(e) or approximately 210^{19} m^{-3} and Tsub(e) approximately 15-20 eV.

3573 (EUR—7425(pt.2), pp 857-862) **Neutral beam injection into the JIPP T-II Stellarator.** Kaneko, O.; Oka, Y.; Okamura, H.; Kunibe, T.; Kuroda, T. (Nagoya University (Japan)). 1981. NTIS (US Sales Only), PC A25/MF A01.

From 2. joint Grenoble-Varenna international symposium on heating in toroidal plasmas; Como, Italy (3 Sep 1980).

Neutral beam injection experiments are carried out in JIPP T-II, which is a hybrid device of stellarator and tokamak. Two neutral beam injectors are equipped tangentially in the direction of parallel (co-injection) and anti-parallel (counter-injection) to the plasma current. Neutral hydrogen beams of 22 keV, 60 kW (co-injection) and 30 kW (counter-injection) are injected into the ohmically heated stellarator plasma and also into the tokamak plasma. The bulk ion heating efficiency for co-injection is around 1.6 eV/kW in the case of stellarator and 1.9 eV/kW in the case of tokamak, while the heating efficiencies for counter-injection are about 1.6 eV/kW in both cases. The difference between the tokamak and the stellarator is considered to be caused by the enhanced orbit loss due to the helical ripples in the stellarator.

3574 (EUR—7425(pt.2), pp 863-873) **Computational studies of the effect of magnetic field "ripple" on neutral beam heating of ZEPHYR.** Lister, G.G.; Gruber, O. (EURATOM-IPP Association, Garching (Federal Republic of Germany)). 1981. NTIS (US Sales Only), PC A25/MF A01.

From 2. joint Grenoble-Varenna international symposium on heating in toroidal plasmas; Como, Italy (3 Sep 1980).

The results of computations to estimate the heating efficiency of neutral injection in the proposed ZEPHYR experiment are presented. A suitably modified version of the Monte-Carlo neutral deposition and orbit following code FREYA was used for these calculations, in which particular emphasis has been placed on the effects of toroidal field ripple. We find that the ripple associated with the preliminary design of the experiment (+-6%) would result in intolerable energy losses due to "ripple trapping" of the fast ions produced by the neutral beam and insufficient heating of the central plasma. The necessary conditions for ignition can be obtained with a total heating power of 25 MW provided the ripple can be reduced to +-1%, in which case energy losses could be kept below 30%. These results are compatible with those found from transport code calculations of the losses to be expected due to ripple enhanced thermal conduction in the plasma.

3575 (EUR—7425(pt.2), pp 875-882) **Electron cooling by the injection of fast neutrals.** Cox, M.; Clark, W.H.M.; Cordey, J.G.; Fielding, S.; Gill, R.D.; Start, D.F.H. (EURATOM-UKAEA Association, Abingdon, Oxon (United Kingdom)). 1981. NTIS (US Sales Only), PC A25/MF A01.

From 2. joint Grenoble-Varenna international symposium on heating in toroidal plasmas; Como, Italy (3 Sep 1980).

During the initial stages of neutral injection heating of tokamak plasmas the electron temperature often falls. The various processes which account for this effect are discussed analytically. For DITE parameters the most important energy loss mechanism is found to be the radiation produced by charge-exchange recombination of the ionised impurities on the injected neutrals. The experimental time behaviour of OVII line emission is compared with the predictions of an ionisation balance code.

3576 (EUR—7425(pt.2), pp 883-888) **Behaviour of fast ions during fast neutrals injection in TFR 600.** Gagey, B. (EURATOM-CEA Association, Fontenay-aux-Roses (France)). 1981. NTIS (US Sales Only), PC A25/MF A01.

From 2. joint Grenoble-Varenna international symposium on heating in toroidal plasmas; Como, Italy (3 Sep 1980).

In TFR 600, the fast neutrals injection is done almost perpendicular to the magnetic field (75°) and it is very crucial to know experimentally the behaviour of the fast ions captured in the plasma. Furthermore, it is expected theoretically that perpendicular injection could be more susceptible to drive microinstabilities. So knowledge of fast ions behaviour is very important for example to do a good energy balance of the heated plasma. In this paper we present at first the electrostatic analyser which has been used to measure the fast ions lost by charge-exchange, secondly the modified Monte-Carlo code which predicts the classical energy spectrum and at last comparisons between the two results.

3577 (EUR—7425(pt.2), pp 889-895) **Simulation of the TEXTOR neutral injection beamline by Monte Carlo methods.** Reiter, D.; Nicolai, A. (EURATOM-KFA Association, Juelich 1 (Federal Republic of Germany)). 1981. NTIS (US Sales Only), PC A25/MF A01.

From 2. joint Grenoble-Varenna international symposium on heating in toroidal plasmas; Como, Italy (3 Sep 1980).

An extension of the NFREYA code is presented accounting for the duct and for a beamlet distribution fatter than Gaussian. Using the data of the TEXTOR beamline the possibility of profile shaping is investigated. The evolution of the hot ion distribution is traced in space and time by solving the Fokker-Planck equation.

3578 (EUR—7425(pt.2), pp 897-909) **Prospects of helium injection into large Tokamak.** Speth, E. (EURATOM-IPP Association, Garching (Federal Republic of Germany)). 1981. NTIS (US Sales Only), PC A25/MF A01.

From 2. joint Grenoble-Varenna international symposium on heating in toroidal plasmas; Como, Italy (3 Sep 1980).

The prospects of helium injection in comparison with deuterium injection into large tokamaks are reviewed, using an analytical, global description involving as key parameters beam energy, ignition temperature and α-particle concentration αsub(i). Special attention has been paid to the accumulation of alpha particles in the plasma, due to the injected beams. In a pure D-T-plasma helium beams penetrate into about the same plasma opacity at 150 keV as deuterium beams but at much higher neutralization efficiency. The effect of the alpha particles accumulating in the plasma, however, degrades the penetration capability, for example 10% of alpha particles in the plasma increases the beam energy by around 50% for the same opacity. The ignition condition is only weakly modified, if the hydrogen ion density in the plasma is kept constant when injecting helium. The plasma beta is slightly increased by the presence of the injected alpha particles, for example 10% of He^{2+} add about 25% to the beta for given nsub(i)tausub(E) at ignition. Comparing maximum tolerable αsub(i) and the actually generated αsub(i) as a function of beam energy and ignition temperature, it is shown that in a full-bore, full-density reactor the penetration requirements for ignition can be fulfilled at energies in excess of 300 keV with an efficiency of $<=25\%$ compared to 230 keV for a deuterium beam and an efficiency of 5%.

3579 (EUR—7425(pt.2), pp 953-959) **Heating of Tokamak plasmas by means of energetic ion beams with Z>1.** Dawson, J.M.; MacKenzie, K. (University of California, Los Angeles (USA)). 1981. NTIS (US Sales Only), PC A25/MF A01.

From 2. joint Grenoble-Varenna international symposium on heating in toroidal plasmas; Como, Italy (3 Sep 1980).

The atoms with $Z > 1$ would be accelerated as singly charged ions to several MeV and injected into the torus tangential to the toroidal direction. As the ions go around the curvature, drift will carry them into the tokamak plasma where the remaining electrons will be stripped off and the ions will be trapped. They then heat the plasma by coulomb collisions. In this paper, a multiampere dc beam at several MeV is proposed by acceleration in stages of 700 keV to 1 MeV at successive gaps.

3580 (EUR—7425(pt.2), pp 961-965) **Heating and Tokamak current maintenance by injection of intense pulsed ion beams.** Manheimer, W.M.; Winsor, N.K.; Hui, B. (Naval Research Laboratory, Washington, D.C. (USA)). 1981. NTIS (US Sales Only), PC A25/MF A01.

From 2. joint Grenoble-Varenna international symposium on heating in toroidal plasmas; Como, Italy (3 Sep 1980).

Plasma beams can now be efficiently produced containing several hundred kilojoules of 1 MeV ions. If such beams can be injected into a magnetically-confined toroidal system, present day tokamaks may have good enough confinement to achieve ignition. This paper describes three possible ways of injecting such beams, and presents simulations of the results of such injection.

3581 (EUR—7425(pt.2), pp 975-984) **Experiments on adiabatic compression of a Tokamak plasma.** Golant, V.E.; Kalmykov, S.G. (A.F. Ioffe Physico-Technical Institute, Leningrad (USSR)). 1981. NTIS (US Sales Only), PC A25/MF A01.

From 2. joint Grenoble-Varenna international symposium on heating in toroidal plasmas; Como, Italy (3 Sep 1980).

Two main types of compression are considered in this paper. The first is achieved by a sufficiently fast increase of the toroidal magnetic field (so-called minor radius compression). The second type of compression is produced by displacing the plasma column to the region of larger magnetic field with the help of a transverse controlling field (so-called major radius compression). These two schemes can also be combined.

3582 (EUR—7425(pt.2), pp 985-990) **Equilibrium and ohmic heating on TUMAN-3 Tokamak.** Vorobjev, G.M.; Gladushchak, V.I.; Golant, V.E. (A.F. Ioffe Physico-Technical Institute, Leningrad (USSR)). 1981. NTIS (US Sales Only), PC A25/MF A01.

From 2. joint Grenoble-Varenna international symposium on heating in toroidal plasmas; Como, Italy (3 Sep 1980).

This paper deals with the results of the early experiments on the TUMAN-3 device, which is a tokamak designed to study the behaviour of plasma during adiabatic compression by increasing the magnetic field with or without RF heating. The main features of the TUMAN-3 tokamak are: the small aspect ratio and the absence of a stabilizing shell. The parameters of the vacuum chamber are: minor radius a=25 cm, major radius R=55 cm. The device's energy supply system provides the quasi stationary magnetic field with B=10 kG and the increasing of this field up to B=30kG in 3 ms. In current experiments the narrow limiter (delta=1.5 cm) is used. The feedback stabilization system and the programmed vertical magnetic field are used for controlling the plasma position. Programmed gas puffing during the discharge is applied.

3583 (EUR—7425(pt.2), pp 991-1001) **Energy balance in the ohmically heated FT.** Bartiromo, R.; Brusati, M.; Cilloco, F. (Associazione EURATOM-CNEN, Frascati, Roma (Italy)). 1981. NTIS (US Sales Only), PC A25/MF A01.

From 2. joint Grenoble-Varenna international symposium on heating in toroidal plasmas; Como, Italy (3 Sep 1980).

A typical discharge in the FT Tokamak at 60 kG has been studied in detail in order to derive the power balance between the ohmic input and the plasma losses. Impurity and radiation losses together with ion and electron energy balance are discussed. A power transport term for electrons is derived which is ascribed to anomalous thermal conduction. This resulting thermal transport is compared with those derived from different proposed scalings.

3584 (EUR—7425(pt.2), pp 1003-1008) **Equilibrium of a turbulently heated Tokamak.** Kolfschoten, A.W.; Rem, J. (EURATOM-FOM Association, Nieuwegein (Netherlands)). 1981. NTIS (US Sales Only), PC A25/MF A01.

From 2. joint Grenoble-Varenna international symposium on heating in toroidal plasmas; Como, Italy (3 Sep 1980).

The TORTUR device at the FOM-Institute for Plasma Physics at Nieuwegein is a small tokamak (R = 0.46 m, a = 0.09 m), which has been designed to study turbulent heating of a plasma in a toroidal geometry. Immediately after the heating pulse is applied. The discharge is characterized by hollow pressure and current profiles. Since the plasma properties are such that MHD equilibrium can be established, we investigated the properties of a class of MHD equilibria that give rise to such characteristic pressure and current profiles.

3585 (EUR—7425(pt.2), pp 1009-1014) **Heating experiments in the Heliotron E.** Besshou, S.; Hanatani, K.; Iiyoshi, A. (Kyoto University, Gokasho, Uji (Japan)). 1981. NTIS (US Sales Only), PC A25/MF A01.

From 2. joint Grenoble-Varenna international symposium on heating in toroidal plasmas; Como, Italy (3 Sep 1980).

This paper describes preliminary results on the Heliotron E device, which is the biggest machine among the asymmetric toroidal systems. The Heliotron E is designed to investigate the "proof of principle" of the heliotron field configuration. The major and average minor radius are 2.2 m and 20 cm, respectively. In the preliminary experiments at the low helical field Bsub(h) = 10 kG, we obtain the high beta plasma $\beta(0)$ of 1%.

3586 (EUR—7425(pt.2), pp 1015-1031) **Thor Tokamak experiment.** Argenti, L.; Bonizzoni, G.; Cirant, S. (EURATOM-CNR Associazione, Milano (Italy)). 1981. NTIS (US Sales Only), PC A25/MF A01.

From 2. joint Grenoble-Varenna international symposium on heating in toroidal plasmas; Como, Italy (3 Sep 1980).

The most significant characteristics of the plasma produced in Thor discharges are described. The results obtained show that the possibility of controlling both the plasma equilibrium and the discharge regime has been fully achieved.

3587 (EUR—7425(pt.2), pp 1035-1051) **Ohmic heating and related topics in reversed field pinches.** Bodin, H.A.B. (EURATOM-UKAEA Association, Abingdon, Oxon (United Kingdom)). 1981. NTIS (US Sales Only), PC A25/MF A01.

From 2. joint Grenoble-Varenna international symposium on heating in toroidal plasmas; Como, Italy (3 Sep 1980).

Analytic and numerical studies of ohmic heating in the reversed field pinch (RFP) are reviewed, giving comparisons with experiment. The possibility of reactor ignition by ohmic heating is briefly discussed and a summary of the present status of RFP research is given. It is now possible to make predictions of the plasma parameters in reasonable agreement with observation for RFP experiments operating with currents of a few hundred kiloamps and temperatures of about 100eV, although the detailed physical processes which take place during the setting up and self reversal phase are still poorly understood. In order to obtain temperatures in the kilovolt range a large experiment with a sustained current of about 2MA is required but predictions in this case depend on using transport coefficients which are untested experimentally in the range of interest. In principle it is possible to obtain ignition by ohmic heating alone in an RFP reactor; the main difference, compared with tokamak, is that the current can be considerably higher in the pinch.

3588 (EUR—7425(pt.2), pp 1053-1057) **Thermal energy diffusion in plasma with weak ohmic heating.** Coppi, B. (Massachusetts Institute of Technology, Cambridge (USA)). 1981. NTIS (US Sales Only), PC A25/MF A01.

From 2. joint Grenoble-Varenna international symposium on heating in toroidal plasmas; Como, Italy (3 Sep 1980).

In this paper we refer to regimes for which most of the electrons' thermal energy is lost through their thermal conductivity and we maintain, the point of view that the plasma current is the driving factor for the observed anomalous diffusion.

3589 (EUR—7425(pt.2), pp 1059-1065) **Start up phase and compression in the Ignitor Tokamak.** Airoldi-Crescentini, A.; Grosso, G.; Lampis, G. (EURATOM-CNR Association, Milano (Italy)); Lanzavecchia, L. (Tecnomasio Italiano Brown Boveri, Milano (Italy)). 1981. NTIS (US Sales Only), PC A25/MF A01.

From 2. joint Grenoble-Varenna international symposium on heating in toroidal plasmas; Como, Italy (3 Sep 1980).

The performance of the Ignitor ohmic heating transformer and power supply is analyzed by means of a numerical code describing the evolution of the main electrical and plasma parameters. The behaviour of the adiabatic compression is presented and the optical conditions for reaching the ignition parameters are investigated.

3590 (EUR—7425(pt.2), pp 1067-1073) **Planning of the ZEPHYR ignition experiment.** Lackner, K. (EURATOM-IPP Association, Garching (Federal Republic of Germany)). 1981. NTIS (US Sales Only), PC A25/MF A01.

From 2. joint Grenoble-Varenna international symposium on heating in toroidal plasmas; Como, Italy (3 Sep 1980).

The paper describes the physical aims and the chosen technical solutions for the ZEPHYR ignition experiment. The primary scope of the experiment is to study the dynamics of thermonuclear burn in different density-temperature regimes, to test methods for the control of the inherent thermal instability, and to find scenarios permitting a controlled shut-down without current disruption. To investigate these questions a tokamak has to be able to reach sufficiently large values of <n>.<T> tau sub(E), and requires a heating method effective in this parameter regime, confinement of the alpha particles, and sufficient pulse length to observe the ignited state over 5 - 10 energy confinement times. Based on presently favoured scaling laws, these scopes can be realized with the smallest effort in additional heating and magnetic field energy in a high field tokamak with cryogenically cooled copper coils.

3591 (EUR—7425(pt.2), pp 1075-1081) **Heating scenarios for the ZEPHYR ignition experiment.** Gruber, O.; Lackner, K.; Neuhauser, J.; Schneider, W.; Wunderlich, R. (EURATOM-IPP Association, Garching (Federal Republic of Germany)). 1981. NTIS (US Sales Only), PC A25/MF A01.

From 2. joint Grenoble-Varenna international symposium on heating in toroidal plasmas; Como, Italy (3 Sep 1980).

Two heating scenarios relevant for high density, high field ignition experiments like ZEPHYR are studied by 1D transport codes: compression boosted neutral injection and -in a simplified manner- high frequency heating without compression. Ignition is obtained for a wide range of plasma and heating parameters and different transport models. Impurities are included in a second step. The existence of a self-regulated radiation cold plasma layer is demonstrated and its compatibility with both heating methods is discussed.

3592 (EUR—7425(pt.2), pp 1083-1087) **Stable heating and burn simulations of a reversed-field pinch reactor.** Moses, R.V. Jr. (Los Alamos Scientific Laboratory, New Mexico (USA)); Nebel, R.A.; Miley, G.H. (University of Illinois, Urbana (USA)). 1981. NTIS (US Sales Only), PC A25/MF A01.

From 2. joint Grenoble-Varenna international symposium on heating in toroidal plasmas; Como, Italy (3 Sep 1980).

The reversed-field pinch provides three significant advantages as a fusion reactor: it can be ohmically heated, it operates at high β, and it is not restricted to a small aspect ratio. Experimentally, the best understood startup scenarios are self reversal, aided reversal and fast-field programming. On the basis of results from a one-dimensional transport and stability code, an ideal MHD stable startup and burn procedure is described in this paper. Pitch programming and a gas feed at the wall are used. This adiabatic startup is characterized by a high pitch near the minor axis and hollow current and pressure profiles. Ideally, it would be possible to have a reactor startup and burn without highly turbulent processes to deposit excessive amounts of energy on the wall. Potential problems of resistive instabilities and plasma-wall interactions are discussed.

3593 (EUR—7425(Pt.2), pp 1089-1095) **DD charged fusion products confinement in the Frascati Tokamak FT.** Bittoni, E. (CNEN, Bologna (Italy)); Haegi, M. (EURATOM-CNEN Association, Frascati/Roma (Italy)). 1981. NTIS (US Sales Only), PC A25/MF A01.

From 2. joint Grenoble-Varenna international symposium on heating in toroidal plasmas; Como, Italy (3 Sep 1980).

An experiment intended to indicate if charged fusion products behave classically in our particular pre "α-particle-heating" regime is designed. Therefore the He^3 particle trajectories have been computed for the FT Tokamak working at a plasma current of 1 MA in deuterium. The 3D numerical code includes the shape of the actual magnetic field ripple and takes account of the fast-particle slowdown due to the friction on the electrons. Wall bombardment density by these particles has been obtained as a function of the azimuthal and the poloidal angles. An experimental arrangement, which should be able to discriminate the immediate losses and the ripple "diffusion" losses is shown.

3594 (EUR—7425(Pt.2), pp 1097-1103) **Thermal instability of a burning toroidal plasma and the possibility of its static stabilization.** Bein, B.K. (Uni-Center, Bochum (Federal Republic of Germany)). 1981. NTIS (US Sales Only), PC A25/MF A01.

From 2. joint Grenoble-Varenna international symposium on heating in toroidal plasmas; Como, Italy (3 Sep 1980).

In the expected range of temperatures of near future ignition experiments and of toroidal fusion reactors, the burning of the D-T plasma is thermally unstable due to the interaction of the alpha-particle heating with the changing plasma background. Other terms of the plasma power balance, i.e. losses due to impurity radiation and plasma edge effects, can contribute to more or less thermal instability. In the present work, the stabilizing/destabilizing contributions of plasma particle loss, of the necessary refuelling process and of the related neutral particle background are analysed. Furthermore, the stabilizing effect of a reduced alpha-particle heating efficiency

and of additional heating are included, and different heat conduction and diffusion coefficients are considered.

3595 (EUR—7425(Pt.2), pp 1105-1111) **Alpha particle loss-cone-type instability in toroidal plasmas.** Malescio, G. (Universita di Pisa (Italy)). 1981. NTIS (US Sales Only), PC A25/MF A01.

From 2. joint Grenoble-Varenna international symposium on heating in toroidal plasmas; Como, Italy (3 Sep 1980).

The anisotropy caused by magnetic curvature drifts in the α-particle distribution function and the resulting destabilization of shear Alfen waves in a tokamak under steady state burn conditions is discussed.

3596 (EUR—7425(Pt.2), pp 1115-1121) **Analytic solutions of Zakharov and Karpman's Fokker-Planck equation and their applications to plasma wave problems.** Moreau, D.; Rolland, P. (EURATOM-CEA Association, Grenoble (France)). 1981. NTIS (US Sales Only), PC A25/MF A01.

From 2. joint Grenoble-Varenna international symposium on heating in toroidal plasmas; Como, Italy (3 Sep 1980).

We discuss the role of collisions in the linear theory of plasma waves and draw some conclusions on the kinetic theorie of parametric instabilities when the pump has a finite wavelength.

3597 (EUR—7425(Pt.2), pp 1123-1128) **New ponderomotive effect in wave heating.** Schamel, H.; Sack, C. (Ruhr-Universitaet, Bochum (Federal Republic of Germany)). 1981. NTIS (US Sales Only), PC A25/MF A01.

From 2. joint Grenoble-Varenna international symposium on heating in toroidal plasmas; Como, Italy (3 Sep 1980).

A novel dissipation mechanism of non-resonant hf-waves arising from temporal variations of the wave amplitude is proposed. The kinetic treatment of ponderomotive effects reveals a third effect besides the ponderomotive force and the velocity-space diffusion which appears as a time-integral over previous states. Ponderomotive streamers are generated by this memory effect of the plasma which interact resonantly with the particle distributions. Estimates on the strength of streamer generation are presented.

3598 (EUR—7425(Pt.2), pp 1129-1134) **Nonlinear damping of electrostatic waves.** Sugihara, R.; Yamanaka, K.; Ohsawa, Y.; Kamimura, T. (Nagoya Unversity (Japan)). 1981. NTIS (US Sales Only), PC A25/MF A01.

From 2. joint Grenoble-Varenna international symposium on heating in toroidal plasmas; Como, Italy (3 Sep 1980).

Recently intense RF waves have been applied to study the possibility of additional heating. The Landau damping of both electrons and ions is considered to be one of the dominant absorption mechanisms of the wave energy for most RF waves. For finite amplitude waves, the linear theoretical treatment of the Landau treatment for damping is expected to prove inadequate. We deal here with nonlinear wave damping by using an invariant perturbation theory and show the deviation of the resultant damping from the linear damping.

3599 (EUR—7425(Pt.2), pp 1135-1139) **Drift waves driven vortices and anomalous plasma diffusion in a strong magnetic field.** Shukla, P.K.; Yu, M.Y.; Spatschek, K.H.; Rahman, H.U. (Ruhr-Universitaet Bochum, (Federal Republic of Germany)). 1981. NTIS (US Sales Only), PC A25/MF A01.

From 2. joint Grenoble-Varenna international symposium on heating in toroidal plasmas; Como, Italy (3 Sep 1980).

Parametric excitation of convective cells by drift wave is considered. Noting that for the convective cells, fluctuation of the electrostatic potential is much larger than that of the density, we derive a set of coupled differential equations describing the interaction of the drift waves and the convective cells. For a weak pump, a general dispersion relation which describes three wave decay and modulational instabilities is given. The growth rate of the latter is found to be generally smaller than that of the decay instability. Our analytical result agrees with computer simulation in which enhanced cells appear in the presence of drift wave turbulence. The problem of anomalous cross-field diffusion is also discussed.

3600 (EUR—7425(Pt.2), pp 1141-1148) **Effects of an azimuthal inhomogeneity of electron density on Tonks-Dattner resonances.** Nonaka, S.; Akao, Y. (Nagoya University (Japan)). 1981. NTIS (US Sales Only), PC A25/MF A01.

From 2. joint Grenoble-Varenna international symposium on heating in toroidal plasmas; Como, Italy (3 Sep 1980).

It was found experimentally that a Tonks-Dattner resonance (T-D resonance) splits into three or four peaks by applying a steady magnetic field of 3.5 gauss perpendicularly to a cylindrical discharge tube. It seems that the third and fourth peaks correspond to new modified resonances in an axially asymmetrical distribution of electron density in a tube.

3601 (EUR—7425(Pt.2), pp 1149-1155) **Heating of parametrically turbulent plasma near electron cyclotron resonance.** Stefan, V. (Boris Kidric Institute of Nuclear Sciences-Vinca, Beograd (Yugoslavia)). 1981. NTIS (US Sales Only), PC A25/MF A01.

From 2. joint Grenoble-Varenna international symposium on heating in toroidal plasmas; Como, Italy (3 Sep 1980).

Parametric absorption processes in a tokamak plasma near electron cyclotron resonance are studied theoretically. As a saturation mechanism of parametrically induced turbulent plasma state, an energy cascade transfer of the electron cyclotron wave from the domain of primary excitation to the domain of lower frequencies is considered. The efficiency of this process for plasma heating is estimated. Both resonant (ω_0 approximately Ωsub(e)) and nonresonant $\omega_0 >>$ Ωsub(e) cases are investigated. In the latter case ($\omega_0 >>$ Ωsub(e)) if the driver pump is taken to be in the pulsed operation, new parametric instabilities, which do not exist if the driver pump is in continuous wave operation, are found.

3602 (EUR—7425(Pt.2), pp 1157-1162) **Methods of driving current by heating a toroidal plasma.** Fisch, N.J. (Princeton University, New Jersey (USA)). 1981. NTIS (US Sales Only), PC A25/MF A01.

From 2. joint Grenoble-Varenna international symposium on heating in toroidal plasmas; Como, Italy (3 Sep 1980).

We survey the possibilities that abound in driving toroidal currents in tokamaks by means of heating mechanisms. In addition to the usual mechanism which utilizes the Ohmic transformer current, which is necessarily pulsed, there exist several steady-state mechanisms. Heating mechanisms which can lend themselves efficiently to continuous current generation include neutral beams, Alfven waves, ion-cyclotron waves, lower-hybrid waves and electron-cyclotron waves.

3603 (EUR—7425(Pt.2), pp 1163-1178) **Simulation of runaway electrons dynamics in a toroidal discharge.** Carretta, U. (CNR-Politecnico di Milano, (Italy)); Grosso, G.; Malacarne, M.; Pozzoli, R. (EURATOM-CNR Association, Milano (Italy)). 1981. NTIS (US Sales Only), PC A25/MF A01.

From 2. joint Grenoble-Varenna international symposium on heating in toroidal plasmas; Como, Italy (3 Sep 1980).

The purpose of this work is to attempt a self-consistent description of the runaway electron dynamics in a tokamak discharge in the frame of a zero-dimensional code. The effect of gas puffing is also exploited. As a matter of reference, we take into consideration the parameters of the Milan "THOR" tokamak. We present the model used for the description of the discharge by considering the transformer and plasma dynamics. The evolution of runaway electrons is explicitly discussed. The results are presented while the relevant equations are given in Appendix.

3604 (EUR—7425(Pt.2), pp 1179-1184) **New calculation of ion conduction due to magnetic ripple in large Tokamak.** Requin, G.; Gagey, B.; Girard, J.P.; Samain, A. (Association EURATOM-CEA, Fontenay-aux-Roses (France)). 1981. NTIS (US Sales Only), PC A25/MF A01.

From 2. joint Grenoble-Varenna international symposium on heating in toroidal plasmas; Como, Italy (3 Sep 1980).

The ion heat conduction due to the ripple diffusion in Tokamaks is calculated in a relatively simple way for various regime of ripple amplitude, of ratio (r/R) and of collision frequency. The most important term of the ion heat conduction due to ripple trap-

ping is found very similar to the one already known but the other terms due to banana drifts or Landau effects differ from previous results what decreases the expected losses at the plasma boundary. In order to illustrate these calculations we apply our results to TFR 600 Tokamak with large ICR heating and we find that the INTOR basic configuration has so important magnetic ripples that ignition does not seem possible unless the central ripple value is reduced five times.

3605 **(EUR—7425(Pt.2)) Heating in toroidal plasmas.** Canobbio, E.; Eubank, H.P.; Leotta, G.G.; Malein, A.; Sindoni, E. (eds.). (Commission of the European Communities, Brussels (Belgium)). 1981. 594p. (CONF-800932—Pt.2). NTIS (US Sales Only), PC A25/MF A01. Order Number DE83780038.

From 2. joint Grenoble-Varenna international symposium on heating in toroidal plasmas; Como, Italy (3 Sep 1980).

Abstracts for each paper were entered into the data base. (MOW)

3606 **(EUR-CEA-FC—1138) Stochastic heating of electrons at electron cyclotron resonance. Experimental study of a plasma in a magnetic well.** Geller, R.; Jacquot, B.; Lamy, T. (Association Euratom-CEA, Centre d'Etudes Nucleaires de Grenoble, 38 (France). Dept. de Recherches sur la Fusion Controlee). Jan 1982. 31p. (In French). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82703134.

The principles of stochastic heating are recalled and an experimental measurement method is described. The basic idea of the method is to detect the thresholds of production for some highly charged ions which are linked to the electron energy. The measurements show that the energy increase versus electromagnetic power is given by $\Delta T = (\Delta Psub(RF))sup(\alpha)$ where α is close to unity. The experimental device is a magnetic well containing an ECR surface where the electron of a plasma are stochastically heated.

3607 **(EUR-CEA-FC—1142) SIG contribution to the technical meeting on radio frequency heating in large fusion experiments.** (Association Euratom-CEA, Centre d'Etudes Nucleaires de Grenoble, 38 (France). Dept. de Recherches sur la Fusion Controlee). Feb 1982. 40p. (CONF-8110229—Exc.). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82703135.

From Technical meeting on radio frequency heating in large fusion experiments; Princeton, NJ, USA (19 Oct 1981).

The 5 following papers were discussed: - a 1.5MW - 0.1S RF generator used for lower hybrid heating in the Petula B experiment; - the first results of a L.H. grill launcher test line whose dimensions are comparable to those of grills used for Petula and for larger machine as Tore Supra; - a grill launcher for L.H. heating in Petula B; - conditioning of grill couplers for L.H. heating in Wega; - conceptual study of L.H. heating of the JET plasma.

3608 **(IAE—3382/7) Liner plasma compression in the systems with acute-angled magnetic fields.** Belan, V.G.; Ivanov, I.A.; Levashov, V.F.; Podkovyrov, V.L. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Atomnoj Ehnergii). 1981. 23p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702996.

Peculiarities of the linear plasma compression in a trap with oncoming fields and in theta pinch with acute-angled magnetic fields near face planes concentrated in a volume considerably less than a volume with a weakly inhomogeneous field have been considered. Thermonuclear system parameters at Q=1 on the basis of the oncoming field trap have been evaluated. Optimal parameters of an acceleration regime and motion stability were determined in experiments on the acute-angled field compre-- ssion with a metal ring. These experiments have shown that a short liner accelerated at an angle to axis reserves a shape of truncated cone up to the collapse moment. Instabilities in the plane normal to the axis didn't develop as well, through an accuracy of liner treatment in thickness wass approximately 5%. Advantages of the liner compression in the oncoming field trap (as compared to the compression with a growing magnetic field in a system with immovable conductors) reveal only in that case, when the volume Vsub(p) of plasma formation is comparable with a total trap volume V including the skin-layer volume in the liners. Three dimensional compression in the oncoming field trap slightly differred from adiabatic, is accompanied with the increase of Vsub(p)/V ratio. Due to flowing out plasma the ion temperature can increase quicker, than in the case of the adiabatic compression, only at Tsub(e)<<Tsub(i). Ring throwing at an angle to the axis permits to produce the acute-angled fields of > or approximately 50 T induction. Any signs of dangerous instabilities in the model experiments were not observed if the liner velocity was high enough.

3609 **(IAE—3426/7) Ion energy balance at joule heating in the "Tokamak-11" device.** Leonov, V.M. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Atomnoj Ehnergii). 1981. 16p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82703138.

Technique for reconstruction of the ion temperature and neutral atoms density radial distributions from chord measurements of charge- exchange atom fluxes are described. Result of plasma energy balance study at joule heating for discharges with various plasma density are presented. Various channels of energy losses from ion component of plasma are analysed.

3610 (IAEA-SMR—82, pp 21-23) **Internal kink modes in TBR.** Caldas, I.L.; Shigueoka, H. (Sao Paulo Univ. (Brazil). Inst. de Fisica); Galvao, R.M.O.; Sakanaka, P.H. (Universidade Estadual de Campinas (Brazil). Inst. de Fisica). Feb 1982. NTIS (US Sales Only), PC A19/MF A01.

From Spring college on fusion energy; Trieste, Italy (26 May 1981).

Using the σ-stability technique with toroidal corrections, the stability of the internal kink modes in TBR (a small research tokamak built at the University of Sao Paulo) has been studied. From the experimental equilibrium data, the growth rates of the nodes have been calculated as a function of qsub(o).

3611 (IAEA-SMR—82, pp 25-28) **Renormalized theories of low frequency turbulence.** Diamond, P.H.; Rosenbluth, M.H. (Texas Univ., Austin (USA). Inst. for Fusion Studies); Hirshman, S.P. (Oak Ridge National Lab., TN (USA)); Myra, J.R. (Science Applications, Inc., Boulder, CO, USA). Feb 1982. NTIS (US Sales Only), PC A19/MF A01.

From Spring college on fusion energy; Trieste, Italy (26 May 1981).

The results of recent investigations in the theory of low frequency microturbulences are presented and summarized.

3612 (IAEA-SMR—82, pp 45-50) **Preliminary results of the TBR small tokamak.** Nascimento, I.C.; Fagundes, A.N.; Da Silva, R.P.; Galvao, R.M.O.; Del Bosco, E.; Vuolo, J.H.; Sanada, E.K.; Dellaqua, R. (Sao Paulo Univ. (Brazil). Inst. de Fisica). Feb 1982. NTIS (US Sales Only), PC A19/MF A01.

From Spring college on fusion energy; Trieste, Italy (26 May 1981).

The paper gives a short description of the TBR - small Brazilian tokamak and the first results obtained for plasma formation and equilibrium. Measured breakdown curves for hydrogen are shown to be confined within analytically calculated limits and to depend strongly on stray vertical magnetic fields. Time profiles of plasma current in equilibrium are shown and compared with the predictions of a simple analytical model for tokamak discharges. Reasonable agreement is obtained taking Zsub(eff) as a free parameter.

3613 (IAEA-SMR—82, pp 51-58) **Drift wave spectra and enhanced transport in plasmas with magnetic shear.** Rogister, A.; Hasselberg, G. (Association Euratom-Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.)). Feb 1982. NTIS (US Sales Only), PC A19/MF A01.

From Spring college on fusion energy; Trieste, Italy (26 May 1981).

We investigate the potentialities of nonlinear scattering of waves off ions as a stabilizing mechanism of drift turbulence in plasmas with magnetic shear. The failure of the random phase averaging procedure and the local character of the interaction in frequency space are the starting point of a reformulation of weak turbulence theory. In particular, the usual integral equation is transformed into a system of two first order differential equations coupling the spectra I(ksub(theta)) and I(ksub(theta)$^{-1}$). The density fluctuation spectrum, which is obtained analytically, has some desirable features in reference to experiment. Firstly, 'eta tilde'ksub(theta)^2 behaves asymptotically (ksub(theta) $\rightarrow$ infinity) as ksub(theta)$^{-4}$; secondly, the high mode numbers (ksub(theta)asub(s) >1) contribute about 80% to the cross field diffusion while the low mode numbers (ksub(theta)asub(s) <1) provide about 80% of the squared density fluctuation. In discussing the transport properties we emphasize the possible role of anomalous heat transfer from electrons to ions. The spectrum of convective cells formed in the interaction of drift waves is obtained; their contribution to the diffusion is found to be negligible, at least in the plasma core.

3614 (IAEA-SMR—82, pp 59-64) **Energy transport in small tokamaks with LH-heating.** Sakanaka, P.H.; Zwi, H. (Universidade Estadual de Campinas (Brazil). Inst. de Fisica); Nascimento, I.C.; Shigueoka, Y. (Sao Paulo Univ. (Brazil). Inst. de Fisica). Feb 1982. NTIS (US Sales Only), PC A19/MF A01.

From Spring college on fusion energy; Trieste, Italy (26 May 1981).

A numerical code has been developed to solve the circuit equation for the Brazilian tokamak, TBR, coupled with the transport code developed by D.E. Post and others, called Baldur, Max-Planck 1980 version. It was found that the best fitting numerical solution with the experimental data is obtained using the pulsator transport coefficients and with Oxygen impurity of the order of 2%. A Lower Hybrid heating of TBR has been studied. It was found that a RF wave with a central frequency of 425 MHz and the parallel index of refraction of Nsub(parallel) approximately 10 to 22 is able to heat plasma by LH mode conversion and electrons by Landau Damping. The central temperature for ions rises from 60 to 260 eV while for electrons goes up from 300 to 460 eV.

3615 (IAEA-SMR—82, pp 79-84) **Nonlinear wave conversion at electron cyclotron resonance and heating of tokamak plasmas.** Stefan, V. (Institut za Nuklearne Nauke Boris Kidric, Belgrade (Yugoslavia)). Feb 1982. NTIS (US Sales Only), PC A19/MF A01.

From Spring college on fusion energy; Trieste, Italy (26 May 1981).

Linear wave conversion at electron cyclotron resonance is considered in a large number of papers. Nonlinear wave conversion at electron cyclotron resonance is significantly less investigated. Here, the conversion of extraordinary and ordinary pump wave into two parametrically excited longitudinal plasma waves is considered. The couplings of upper hybrid (UH) electron Bernstein (EB) and obliquely propagating electron cyclotron waves (OEC) with low IS(L) or high frequency IS(H) ion-sound waves are studied. Thresholds and maximum parametric increments for these processes are given. In the nonlinear phase of development of parametric instabilities, cascade processes, which are based on collisional mechanism of dissipation of parametrically excited plasma waves, are studied. Based on this saturation mechanism, the anomalous collision frequencies and anomalous absorption lengths are evaluated. Finally, the comparision of linear and nonlinear plasma absorption processes is presented.

3616 (IAEA-SMR—82, pp 85-88) **Ion cyclotron resonance heating.** Tajima, T. (Texas Univ., Austin (USA). Inst. for Fusion Studies). Feb 1982. NTIS (US Sales Only), PC A19/MF A01.

From Spring college on fusion energy; Trieste, Italy (26 May 1981).

Ion cyclotron resonance heating of plasmas in tokamak and EBT configurations has been studied using 1-2/2 and 2-1/2 dimensional fully self-consistent electromagnetic particle codes. We have tested two major antenna configurations; we have also compared heating efficiencies for one and two ion species plasmas. We model a tokamak plasma with a uniform poloidal field and 1/R toroidal field on a particular q surface. Ion cyclotron waves are excited on the low field side by antennas parallel either to the poloidal direction or to the toroidal direction with different phase velocities. In 2D, minority ion heating (vsub(perpendicular)) and electron heating (vsub(parallel),vsub(perpendicular)) are observed. The exponential electron heating seems due to the decay instability. The minority heating is consistent with mode conversion of fast Alfven waves and heating by electrostatic ion cyclotron modes. Minority heating is stronger with a poloidal antenna. The strong electron heating is accompanied by toroidal current generation. In 1D, no thermal instability was observed and only strong minority heating resulted. For an EBT plasma we model it by a multiple mirror. We have tested heating efficiency with various minority concentrations, temperatures, mirror ratios, and phase velocities. In this geometry we have beach or inverse beach heating associated with the mode conversion layer perpendicular to the toroidal field. No appreciable electron heating is observed. Heating of ions is linear in time. For both tokamak and EBT slight majority heating above the collisional rate is observed due to the second harmonic heating.

3617 (IAEA-SMR—82, pp 89-93) **Decay instability of a whistler in a plasma.** Tewari, D.P. (Indian Inst. of Tech., New Delhi. Dept. of Physics); Sharma, R.R. (California Univ., Los Angeles (USA). Dept. of Physics). Feb 1982. NTIS (US Sales Only), PC A19/MF A01.

From Spring college on fusion energy; Trieste, Italy (26 May 1981).

The parametric instabilities of a high power whistler in a high density plasma possess large growth rate when the scattered sideband is an electrostatic lower hybrid mode. The efficient channels of decay include oscillating two stream instability, nonlinear Landau damping and resonant decay involving ion acoustic and ion cyclotron modes. The processes of nonlinear scattering, i.e., the ones possessing whistler sidebands are relatively less significant.

3618 (IAEA-SMR—82, pp 99-108) **Production of plasma vortices by lower hybrid waves.** Yu, M.Y.; Shukla, P.K.; Rahman, H.U. (Bochum Univ. (Germany, F.R.). Inst. fuer Theoretische Physik). Feb 1982. NTIS (US Sales Only), PC A19/MF A01.

From Spring college on fusion energy; Trieste, Italy (26 May 1981).

Nonlinear excitation of electrostatic and magnetostatic zero-frequency modes by finite amplitude lower-hybrid waves is considered. It is found that modulational instabilities can give rise to enhanced plasma vortices. Dispersion relations, as well as analytical expressions for the growth rates, are obtained. The enhanced vortices may cause anomalous cross-field diffusion which can affect plasma confinement in tokamak devices when lower hybrid waves are used for plasma heating or current-drive. We found that magnetic fluctuations associated with the parametrically driven magnetostatic mode are of particular importance in tokamak plasmas.

3619 (IAEA-SMR—82, pp 109-111) **Some properties of frequency doubling in magnetoactive plasma.** Cadez, V.M.; Jovanovic, D. (Belgrade Univ. (Yugoslavia). Inst. za Fiziku). Feb 1982. NTIS (US Sales Only), PC A19/MF A01.

From Spring college on fusion energy; Trieste, Italy (26 May 1981).

Second harmonic generation in homogeneous, collisional, magnetoactive plasma is investigated under various conditions. Some relevant energy requirements are pointed out.

3620 (IAEA-SMR—82, pp 119-122) **Dissipation of Langmuir condensate under strong turbulence.** Dasgupta, N. (Burdwan Univ., West Bengal (India). Dept. of Physics); Dasgupta, B. (Saha Inst. of Nuclear Physics, Calcutta (India)); Dasgupta, P. (Kalyani Univ., West Bengal, India). Feb 1982. NTIS (US Sales Only), PC A19/MF A01.

From Spring college on fusion energy; Trieste, Italy (26 May 1981).

Dissipation of Langmuir condensate formed through interaction of plasma with high density electron beam is investigated using

a hybrid model which combines a multi-soliton picture of strong turbulence with kinetic theory approach. An equation for the particle distribution function has been derived and numerically investigated for various choices of soliton distribution. The results enable us to draw certain conclusions about the heating efficiency of high density electron beams for plasma under laboratory conditions.

3621 (IAEA-SMR—82, pp 123-127) **Extension of modulational instability domain of Langmuir wave due to four wave interaction.** Gupta, M.R. (Calcutta Univ. (India). Centre of Advanced Study in Applied Mathematics); Som, B.K. (Dept. of Physics, B.K. Girls' College, Howrah, West Bengal, India); Dasgupta, B. (Saha Inst. of Nuclear Physics, Calcutta (India)). Feb 1982. NTIS (US Sales Only), PC A19/MF A01.

From Spring college on fusion energy; Trieste, Italy (26 May 1981).

It is shown that when Langmuir and dispersive acoustic waves propagates in a plasma with equal group velocities, the two coupled non-linear Schroedinger equations which describe the propagation of the two interacting waves predict that even small amplitude Langmuir waves are rendered modulationally unstable for large perturbation wave number. Unstability has a growth rate approximately (msub(e)/msub(i))sup(1/4) ('Esub(Lang)'²/ 8PIn₀Tsub(e)) and is found to be a consequence of resonant four wave interaction.

3622 (IAEA-SMR—82, pp 137-140) **Ponderomotive force in a plasma medium.** Kono, M. (Kyushu Univ., Fukuoka (Japan). Research Inst. for Applied Mechanics); Skoric, M.M. (Institut za Nuklearne Nauke Boris Kidric, Belgrade (Yugoslavia)); Ter Haar, D. (Oxford Univ. (UK). Dept. of Theoretical Physics). Feb 1982. NTIS (US Sales Only), PC A19/MF A01.

From Spring college on fusion energy; Trieste, Italy (26 May 1981).

The form of the ponderomotive force in a plasma medium in a high-frequency electromagnetic field is discussed. By carefully taking into account the symmetry of the stress tensor we find an extra contribution to the ponderomotive force not discussed so far in the literature, which can lead to the self-generation of magnetic fields in a collisionless plasma medium. We shall argue that the complete form of the time-averaged ponderomotive force in a plasma without an external magnetic field includes apart from the familiar potential force a new-solenoidal contribution. We show that the above formula is consistent with both stress tensor formalism and kinetic theory arguments.

3623 (IAEA-SMR—82, pp 155-159) **Some aspects of transformation of the nonlinear plasma equations to the space-independent frame.** Paul, S.N.; Chakraborty, B. (Jadavpur Univ., Calcutta (India). Dept. of Mathematics). Feb 1982. NTIS (US Sales Only), PC A19/MF A01.

From Spring college on fusion energy; Trieste, Italy (26 May 1981).

Relativistically correct transformation of nonlinear plasma equations are derived in a space-independent frame. This transformation is useful in many ways because in place of partial differential equations one obtains a set of ordinary differential equations in a single independent variable. Equations of Akhiezer and Polovin (1956) for nonlinear plasma oscillations have been generalized and the results of Arons and Max (1974), and others for wave number shift and precessional rotation of electromagnetic wave are recovered in a space-independent frame.

3624 (IAEA-SMR—82, pp 161-165) **Temporal and spectral analysis of enhanced stimulated Brillouin scattering from a CO_2-laser irradiated plasma.** Rizvi, S.A.H.; Handke, J.; Kronast, B. (Bochum Univ. (Germany, F.R.)). Feb 1982. NTIS (US Sales Only), PC A19/MF A01.

From Spring college on fusion energy; Trieste, Italy (26 May 1981).

Some important aspects of Stimulated Brillouin Scattering (SBS) have been investigated experimentally. Our study shows the possibility of 100% reflectivity from an homogeneous H_2 underdense plasma at laser intensity below 10^{17} Wm^{-2}. Our results can be understood in terms of simple theoretical models.

3625 (IAEA-SMR—82, pp 167-173) **About the generation of electromagnetic radiation by a strong-turbulent plasma.** Rubenchik, A.M. (AN SSSR, Novosibirsk. Inst. Avtomatiki i Ehlektrometrii). Feb 1982. NTIS (US Sales Only), PC A19/MF A01.

From Spring college on fusion energy; Trieste, Italy (26 May 1981).

A wide range of phenomena where the generation of electromagnetic radiation is caused by plasma turbulence with a high level of oscillations is studied in detail in the last years. First of all we mean the generation of incident radiation harmonics in laser plasmas and also a number of astrophysical phenomena. Within the strong-turbulent regime plasma oscillations form localized cavities, as a result of the modulation instability development, which collapse in a finite time. As a result of the Langmuir collapse there occurs energy dissipation. Simultaneously the collapsing cavities generate electromagnetic radiation whose parameters can be easily determined, because the evolution of a single cavity is well studied at present. In the paper we calculate conversion coefficients, i.e. ratio of the energy radiated at a given frequency to the energy absorbed by the collapse process. The coefficients are universal and they depend on plasma temperature and the level of plasma turbulence. Main results of this paper are devoted to laser plasmas, in particular to the problem of harmonics generation.

3626 (IAEA-SMR—82, pp 193-206) **Plasma confinement in ECH bumpy torus.** Fujiwara, M.; Kamimura, T.; Ikegami, H. (Nagoya Univ. (Japan). Inst. of Plasma Physics). Feb 1982. NTIS (US Sales Only), PC A19/MF A01.

From Spring college on fusion energy; Trieste, Italy (26 May 1981).

Theoretical and experimental researches are reviewed on plasma confinement in ECH bumpy torus. Numerical study on particle confinement found that the particle confinement by vacuum magnetic field is the combination of toroidal and mirror-like trap depending strongly on spatial position. The ambipolar potential improves confinement greatly and the critical energy of confined particles W is up to epsilonsub(t)$^{-1}$(ephi) (here epsilonsub(t) and phi are the inverse aspect ratio and plasma potential well or hill), while W approximately ephi in tandem mirror configuration. Some useful suggestions are given to conventional neoclassical transport theory. Experimental results are also surveyed especially focused on the scaling laws of the toroidal core plasma and hot electron ring parameters. The formation of hot electron rings is possible under some special conditions where ECH heating overcome the Coulomb drag cooling by background plasmas. In other words this condition determines the maximum density of toroidal core plasma. Attainable beta value or stored energy of hot electron rings is summarized by using experimental data of various machines. Brief report is presented on recent experiments of ICH in NBT device. ICH not only contributes to ion heating, but affects the plasma potential which has an important effect on transport. Some results are also reported with respect to theoretical analysis of stability and equilibrium.

3627 (IAEA-SMR—82, pp 207-211) **Physics issues of an EBT reactor.** Uckan, N.A. (Oak Ridge National Lab., TN (USA)). Feb 1982. NTIS (US Sales Only), PC A19/MF A01.

From Spring college on fusion energy; Trieste, Italy (26 May 1981).

The ELMO Bumpy Torus (EBT) concept provides a unique basis for a steady-state fusion reactor in a favorable geometry, and it has the potential for a high power density with a significant Q value. The similarity of the dimensionless parameters of the present experiments to a reactor grade plasma and observed confinement characteristics indicates plausible extrapolations and projections for a reactor; however, there are a number of physics (as well as technology) issues to be resolved. There are difficulties in extrapolating results of simplified (and/or untested) theoretical models to an actual closely coupled, hybrid (toroidal core, hot electron ring, surface plasma, etc.) geometry. There are also uncertainties in extrapolating experimental results from low density, low temperature (low beta) plasmas to predict the behaviour of a burning plasma. Basically, the plasma physics areas that influence the operating characteristics of EBTs are the following: (1) particle orbits, equilibrium, and

magnetic; (2) stability boundaries of both core and ring plasmas; (3) transport scaling; (4) heating; and (5) ring-core interaction and power balance. In addition to the "conventional" mode of EBT operation, innovative ideas that enhance the reactor performance include: (a) the use of supplementary (and/or trim) coils to improve confinement (and/or stability); (b) control of ambipolar potential (and its sign, i.e., positive electric field) to enhance confinement (and to be able to burn alternative fuels, i.e., D-D, etc., in a reasonably sized reactor); and (c) the possibility of "fundamental ring" mode heating to reduce microwave frequency requirements by a factor of 2. This paper reviews each of these areas briefly and discusses their projections to a reactor.

3628 (IAEA-SMR—82, pp 213-217) **Beta limits in EBT and their implications for a reactor.** Uckan, N.A.; Spong, D.A. (Oak Ridge National Lab., TN (USA)); Nelson, D.B. (Department of Energy, Washington, DC (USA). Office of Fusion Energy). Feb 1982. NTIS (US Sales Only), PC A19/MF A01.

From Spring college on fusion energy; Trieste, Italy (26 May 1981).

Theoretical models indicate limits on core beta ranging from a few percent to 10-20% depending on the models and/or assumptions. Some of the parameters that enter into these beta limits are: the ratio of the ring radial scale length to the average radius of curvature, epsilon=Δ/Rsub(c); the ratio of the cold to the hot plasma density, fsub(R)=nsub(cold)/nsub(hot); the ratios of the hot electron drift frequency to the ion cyclotron frequency, ωsub(dh)/ωsub(ci), and to the drift Alfven frequency ωsub(dh)/kVsub(A); the ratio of the ring electron temperature to the core ion temperature, Tsub(R)/Tsub(i); the ring beta βsub(R); etc. Because of uncertainties in extrapolating results of simplifield models to a reactor plasma, the above parameters that influence the beta limits cannot be determined accurately at the present time. Also, reasonable changes within the models and/or assumptions are seen to affect the core beta limits by almost an order of magnitude. Hence, at the present, these limits cannot be used as a rigid (and reliable) requirement for ELMO Bumpy Torus (EBT) reactor engineering considerations. However, sensitivity studies can be carried out to determine the boundaries of the operating regime and to demonstrate the effects of various modes, assumptions, and models on reactor performance (Q value). First the modes believed to limit the core β and ring plasma performance are discussed, and the simplifications and/or assumptions involved in deriving these limits are highlighted. Then, the implications of these limits for a reactor are given.

3629 (IAEA-SMR—82, pp 219-222) **Production of plasma currents using rotating magnetic fields.** Hugrass, W.N.; Jones, I.R.; McKenna, K.F. (Flinders Univ. of South Australia, Bedford Park). Feb 1982. NTIS (US Sales Only), PC A19/MF A01.

From Spring college on fusion energy; Trieste, Italy (26 May 1981).

The use of a rotating magnetic field to drive a steady azimuthal current in a plasma cylinder has been investigated. The results of theoretical and experimental studies show that a rotating magnetic field of suitable amplitude and rotation frequency penetrates into the plasma much farther than the classical skin depth. This enhanced penetration is accompanied by the generation of a steady azimuthal current in the plasma cylinder. This technique has been utilized to set up a compact torus plasma configuration: The Rotamak. Current and field measurements carried out on a preliminary experiment have verified the generation of toroidal current of about 7 KA in a spherical discharge vessel of 6.4 cm radius.

3630 (IAEA-SMR—82, pp 223-226) **Resistive instabilities in reversed field configurations.** Santiago, M.A.M.; Galvao, R.M.O.; Sakanaka, P.H. (Universidade Estadual de Campinas (Brazil). Inst. de Fisica). Feb 1982. NTIS (US Sales Only), PC A19/MF A01.

From Spring college on fusion energy; Trieste, Italy (26 May 1981).

Resistive modes are studied in reversed-field configurations including the effect of the rotation of the plasma column. It is shown that the m=0 mode, where m is the azimuthal mode number, reduces to the usual tearing mode only in the limit of vanishing plasma rotation. For a finite value of rotation, the m=0 mode becomes compressional with its growth rate proportional to the 1/3-power of the plasma resistivity. The effect of a sheared rotation profile on the resistive m=1 mode is also studied. It is shown that in the presence of sheared rotation the growth rate becomes complex and the mode may be stabilized.

3631 (IAEA-SMR—82, pp 227-231) **Theory of stationary charged particle ensembles in strongly non-homogeneous azimuthally symmetric magnetic fields.** Auluck, S.K.H. (Bhabha Atomic Research Centre, Bombay (India). Neutron Physics Div.). Feb 1982. NTIS (US Sales Only), PC A19/MF A01.

From Spring college on fusion energy; Trieste, Italy (26 May 1981).

A method of treating problems involving strongly nonadiabatic particle orbits in a magnetic field is described for the case when the system is long-lived on the collisional time scale. A canonical distribution $P=Z^{-1}\exp-\beta(H+\Omega$psub(theta)) results from maximization of entropy subject to conservation of the Hamiltonian H and canonical angular momentum psub(theta) for an azimuthally symmetric system. By taking the MIGMA problem as an example, the method of determining the constants β,Ω,Z from the average energy, average angular momentum and the total number of particles is illustrated. Associated physical effects are discussed.

3632 (IAEA-SMR—82, pp 233-238) **Charged particle confinement in magnetic mirror.** Bora, D.; John, P.I.; Saxena, Y.C.; Varma, R.K. (Physical Research Lab., Ahmedabad (India)). Feb 1982. NTIS (US Sales Only), PC A19/MF A01.

From Spring college on fusion energy; Trieste, Italy (26 May 1981).

The behaviour of single charged particle trapped in a magnetic mirror has been investigated experimentally. The particle injected off axis and trapped in a magnetic mirror, leak out of the mirror with the leakage characterized by multiple decay times. The observed decay times are in good agreement with predictions of a "wave mechanical like" model by Varma, over a large range of relevant parameters.

3633 (IAEA-SMR—82, pp 239-246) **Tandem mirror research program in University of Tsukuba.** Miyoshi, S.; Inutake, M.; Ishii, K. (Tsukuba Univ., Sakura, Ibaraki (Japan)). Feb 1982. NTIS (US Sales Only), PC A19/MF A01.

From Spring college on fusion energy; Trieste, Italy (26 May 1981).

In addition to the first tandem mirror machine Gamma 6, which came to operation in 1978, a larger scale tandem mirror machine Gamma 10 program is being promoted in Plasma Research Center, The University of Tsukuba. We report major experimental results in Gamma 6 and conceptual design and main physical issues on Gamma 10.

3634 (IAEA-SMR—82, pp 247-253) **Steady states of a partially ionized gas near a wall.** Nocentini, A. (Instituto di Meccanica dell'Universita, Trieste, Italy); Sestero, A. (Associazione Euratom-CNEN Fusione, Frascati, Italy). Feb 1982. NTIS (US Sales Only), PC A19/MF A01.

From Spring college on fusion energy; Trieste, Italy (26 May 1981).

The problem of the steady states of a clean plasma in front of a wall is studied with kinetic equations. It is shown that it is possible to distinguish between two characteristic lengths: the charge exchange length, on which "temperature" equilibration between ionized and neutral particles is reached, and the longer charge exchange-ionization length, on which the usual fluid treatment is applicable.

3635 (IAEA-SMR—82, pp 261-268) **Soliton scattering of relativistic electron beam.** Singh, R.N. (Banaras Hindu Univ. (India). Inst. of Tech.). Feb 1982. NTIS (US Sales Only), PC A19/MF A01.

From Spring college on fusion energy; Trieste, Italy (26 May 1981).

The passage of relativistic electron beam through a gas chamber has been considered. The passage of relativistic electron

beam generates dense plasma in a gas chamber. The large amplitude Langmuir waves are excited which satisfy the nonlinear dispersion relation. The nonlinear Schroedinger equation in dense plasma admits modulationally unstable envelope solitons. The experimental plasma conditions have shown existence of a large number of stationary solitons. Considering the number density of solitons their width and separation, we have studied the problem of scattering of relativistic electrons. An appropriate form of potential distribution resembling with the soliton potential has been considered. Soliton scattering cross-section has been computed using the potential scattering theory. The computed total cross-section conforms well with the measured relativistic electron beam current. The angular scattering measured with the help of angle analyser has been found to deviate from the Gaussian distribution. The departure from the Gaussian distribution of scattering angle is interpreted to arise from soliton scattering. The enhanced cross-section results into excessive attenuation and breaking of the relativistic electron beam. Various other related aspects have been discussed in this paper.

3636 (IAEA-SMR—82, pp 275-279) **Neutron yield, current sheath magnetic structures and thermonuclear features of the dense plasma focus.** Gratton, R.; Ferro Fontan, C.; Kelly, H.; Pouzo, J.; Milanese, M.; Sicardi Schifino, A.; Casin, G.; Esper, M. (Buenos Aires Univ. Nacional (Argentina). Facultad de Ciencias Exactas y Naturales; Direccion General de Investigacion y Desarrollo, Ministerio de Defensa, Buenos Aires, Argentina). Feb 1982. NTIS (US Sales Only), PC A19/MF A01.

From Spring college on fusion energy; Trieste, Italy (26 May 1981).

We report recent measurements and discuss ideas currently being developed at this laboratory, concerning the production of fusion reactions in Plasma Focus (PF) devices and their scaling.

3637 (IAEA-SMR—82, pp 281-287) **Some high-frequency oscillations in a reflex discharge.** Guharay, S.K. (Saha Inst. of Nuclear Physics, Calcutta (India)). Feb 1982. NTIS (US Sales Only), PC A19/MF A01.

From Spring college on fusion energy; Trieste, Italy (26 May 1981).

The aim of the present work is to delineate a controlled experiment with a cold-cathode reflex discharge to acknowledge the nature of the h.f. oscillations. It is observed that oscillations of frequency in the neighbourhood of the ion dynamics are excited through the interaction of counterstreaming electron beams with a background plasma.

3638 (IAEA-SMR—82, pp 297-303) **Geometrical optimization of the dense plasma focus.** Lee, S.; Chen, Y.H. (Malaya Univ., Kuala Lumpur (Malaysia)). Feb 1982. NTIS (US Sales Only), PC A19/MF A01.

From Spring college on fusion energy; Trieste, Italy (26 May 1981).

A 12 kJ DPF device with a periodic time of 12μsec, UMDPF1 has been optimized geometrically to produce a higher neutron yield of 1.5×10^9 at 10 torr filling pressure than from the same device before optimization. With the same optimization procedure a faster DPF device with a periodic time of 3.7μsec, UMDPF2, of the same energy has also been optimized to give a peak neutron yield of 6.3×10^9 at 16 torr filling pressure. Experimental evidence shows that over and above the increase in neutron production due to an increase in current according to the Isup(3.3) scaling law, a faster current rise time may have an additional effect of enhancement in neutron production. The outcome of this project is that a new high pressure regime of 16 torr with an enhanced neutron yield of 6.3×10^9 and improved yield reproducibility for an input energy of 12 kJ has thus been established. There is every reason to believe that this optimization procedure can be extended to other DPF devices.

3639 (IAEA-SMR—82, pp 305-311) **Double layers with an expanding plasma.** Mattoo, S.K.; Saxena, Y.C.; Sekar, A.N. (Physical Research Lab., Ahmedabad (India)). Feb 1982. NTIS (US Sales Only), PC A19/MF A01.

From Spring college on fusion energy; Trieste, Italy (26 May 1981).

Double layers with thickness approximately Debye length are observed. They precede a plasma expanding with a velocity approximately 5(kTe/mi)sup(1/2).

3640 (IAEA-SMR—82, pp 313-319) **Ion confinement by high-density plasmoids and wall-material damage.** Nardi, V.; Bostick, W.H.; Choi, J.; Kilic, H.; Prior, W. (Stevens Inst. of Tech., Hoboken, NJ (USA)); Bortolotti, A.; Cortese, C. (Ferrara Univ. (Italy)). Feb 1982. NTIS (US Sales Only), PC A19/MF A01.

From Spring college on fusion energy; Trieste, Italy (26 May 1981).

Plasma lumps with a density $>10^{18}$ cm^{-3} and sharply defined boundaries (plasmoids) are produced and ejected simultaneously with electron and ion beams (1 keV-2 MeV) during the subnanosecond disruption of a MA current channel in deuterium plasma by a plasma-focus discharge. The internal structure of plasmoids and ion beams is recorded by the induced damage on targets of various materials (the space resolution of the beam structure is better than 1 μm; the space resolution of the structure of the plasmoid boundary on the plasmoid image by a contact print on plastic materials is about 50 μm or better). We report here observations of damage on A1, A1 oxide and stainless steel under plasma conditions by which extreme values of radiation-dose rate are provided by ion beams and by plasmoid impact on the target.

3641 (IAEA-SMR—82, pp 321-326) **Fissioning of nonlinear ion-acoustic rarefactive pulse in a homogeneous quiescent plasma.** Saxena, Y.C.; Mattoo, S.K.; Sekar, A.N. (Physical Research Lab., Ahmedabad (India)). Feb 1982. NTIS (US Sales Only), PC A19/MF A01.

From Spring college on fusion energy; Trieste, Italy (26 May 1981).

A finite amplitude rarefactive ion-acoustic wave is observed to fission resulting in two minima. After fissioning the two minima travel at different speeds, one at 0.8 Csub(s) and the other at 1.2 Csub(s), where Csub(s) is the ion-acoustic speed.

3642 (IAEA-SMR—82, pp 327-330) **Preliminary results obtained from a dense plasma focus.** Sinman, S. (Middle East Technical Univ., Ankara (Turkey)); Sinman, A. (Ankara Nuclear Research and Training Center (Turkey)). Feb 1982. NTIS (US Sales Only), PC A19/MF A01.

From Spring college on fusion energy; Trieste, Italy (26 May 1981).

In this study, for the data processing in our Dense Plasma Focus (DPF) system, a multiparameters numerical hierarchy obtained from the fundamental equations based on the snowplows model and its conclusions have been developed. Evaluating the data along the transients of the total plasma current, the anode current and the focus voltage recorded by an oscilloscope, they have been possible to determine the time domain plasma parameters such as the shock thickness, the sheath temperature, velocity and electron density, the pressure at the focus phase and the plasma temperature. Besides, the dissipated energy through the focus notch or in other words, the plasma temperature has also been calculated by means of the numerical integration. In the text, a performance chart together with some other correlation curves for the optimization of the DPF systems are submitted and discussed.

3643 (IAEA-SMR—82, pp 337-341) **Vacuum spark as a fusion device.** Wong, C.S.; Lee, S. (Malaya Univ., Kuala Lumpur (Malaysia)). Feb 1982. NTIS (US Sales Only), PC A19/MF A01.

From Spring college on fusion energy; Trieste, Italy (26 May 1981).

The existence of extremely hot and dense plasma state in a vacuum spark has inspired the investigation of the possibility of developing it as a fusion device. Effort to achieve this aim has been carried out in the Plasma Physics Laboratory, University of Malaysia and this is presented in this paper. A reproducible and consistent vacuum spark system with input energy of 13 kJ has been built and tested. The electron temperature of the plasma produced in this vacuum spark system has been estimated to be about 4 to 10 kev. Attempt to introduce LiD into the system in order to achieve fusion is also described.

3644 (IAEA-SMR—82, pp 343-348) **Higher order Chapman-Enskog method in plasma applications.** Blenski, T. (Computing Center CYFRONET, Institute of Nuclear Research, Swierk, Poland). Feb 1982. NTIS (US Sales Only), PC A19/MF A01.

From Spring college on fusion energy; Trieste, Italy (26 May 1981).

A Chapman-Enskog method, based on the singular perturbation method, is applied to the Lorentz model for collisional electrons in quasineutral plasma. The fluid and initial layer solutions are constructed up to second order in the small parameter. The corrections for the initial conditions for the fluid quantities are found.

3645 (IAEA-SMR—82, pp 349-352) **Compressional Alfven instability in ECRH plasmas.** El Nadi, A. (Oak Ridge National Lab., TN (USA); Cairo Univ. (Egypt)). Feb 1982. NTIS (US Sales Only), PC A19/MF A01.

From Spring college on fusion energy; Trieste, Italy (26 May 1981).

It is shown that the hot electron component present in an electron cyclotron resonance heated plasma can destabilize the compressional Alfven wave if β of the background plasma exceeds a certain limit. The relevance of the result to the Elmo Bumpy Torus experiment is discussed.

3646 (IAEA-SMR—82, pp 359-365) **Free-boundary problems in magnetohydrodynamics.** Goedbloed, J.P. (Association Euratom-FOM, Instituut voor Plasmafysica "Rijnhuizen", Nieuwegein, Netherlands). Feb 1982. NTIS (US Sales Only), PC A19/MF A01.

From Spring college on fusion energy; Trieste, Italy (26 May 1981).

It is demonstrated that the free-boundary equilibrium of a high-β tokamak exhibits features that are basically different from previous fixed-boundary analyses, in particular as regards β-limits with respect to global equilibrium and stability properties.

3647 (IAEA-SMR—82, pp 367-372) **Magnetic and temperature effects on the energy loss rate of test ions.** Hassan, M.H.A. (Liverpool Univ. (UK). Dept. of Applied Mathematics and Theoretical Physics); Sakanaka, P.H. (Universidade Estadual de Campinas (Brazil). Inst. de Fisica). Feb 1982. NTIS (US Sales Only), PC A19/MF A01.

From Spring college on fusion energy; Trieste, Italy (26 May 1981).

The energy loss rate, E', of test ions injected with velocity V into a Maxwellian electron-ion plasma in the presence of an external magnetic field is studied. Most of the integrals appearing in the expression for E' are evaluated analytically and the remaining integrals are evaluated numerically for various values of the parameters eta=Ωsub(e)ωsub(e)$^{-1}$, x=Vvsub(e)$^{-1}$, r=Tsub(e)Tsub(i)$^{-1}$, and the angle of injection THETA. It is shown that the effect of the magnetic field is rather small except for eta >1, the temperature ratio is important for small x (x >=0.2), and the injection angle is not important.

3648 (IAEA-SMR—82, pp 373-376) **Plasma physics studies in Singapore.** Jones, R. (Singapore Univ. (Singapore)). Feb 1982. NTIS (US Sales Only), PC A19/MF A01.

From Spring college on fusion energy; Trieste, Italy (26 May 1981).

We briefly outline the plasma physics research program being conducted in the Department of Physics of the National University of Singapore. The work places particular emphasis on open system end plugging, ion source development, and anomalous transport studies.

3649 (IAEA-SMR—82, pp 377-379) **Particle acceleration by electromagnetic pulses.** Lai, H.M. (Chinese Univ. of Hong Kong, Shatin). Feb 1982. NTIS (US Sales Only), PC A19/MF A01.

From Spring college on fusion energy; Trieste, Italy (26 May 1981).

Particle interaction with plane electromagnetic pulses is studied. It is shown that particle acceleration by a wavy pulse, depending on the shape of the pulse, may not be small. Further, a diffusive-type particle acceleration by multiple weak pulses is described and discussed.

3650 (IAEA-SMR—82, pp 381-385) **Ion acoustic-Langmuir interactions in collisional and viscous plasmas.** Mohan, M.; Buti, B. (Physical Research Lab., Ahmedabad (India)). Feb 1982. NTIS (US Sales Only), PC A19/MF A01.

From Spring college on fusion energy; Trieste, Italy (26 May 1981).

A pair of modified Zakharov equations coupling the high frequency Langmuir oscillations to the low frequency ion acoustic perturbations in a turbulent, collisional plasma with a neutral background is derived. The time evolution of the coupled ion acoustic-Langmuir solitons show that the electron-ion and electron-neutral collisions damp the Langmuir oscillations and let the ion density perturbations radiate away. On the other hand, the ion-neutral collisions damp the ion density perturbations letting the Langmuir oscillations flow out. In the case of ion viscosity, however, both the ion density perturbations and Langmuir oscillations radiate away one after the other. In these processes, electron-ion and electron-neutral collisions seem to dominate over the other two.

3651 (IAEA-SMR—82, pp 397-401) **Application of the descriptive function on non-linear electromagnetic phenomena.** Silva, H.T. (Universidad del Norte, Dept. de Electronica, Arica, Chile). Feb 1982. NTIS (US Sales Only), PC A19/MF A01.

From Spring college on fusion energy; Trieste, Italy (26 May 1981).

This paper presents the solution of the nonlinear plan wave equation in non-equilibrium dielectric medium. The descriptive function appears as a useful tool to describe the medium response when it is possible to consider intensive electromagnetic response. Despite it has been considered an ideal situation of a limitless nonlinear medium, the results constitute a solid basis to mold more complex processes, such as those which take place in the plasma physics.

3652 (IAEA-SMR—82, pp 403-406) **Tearing and reconnection.** Tajima, T. (Texas Univ., Austin (USA). Inst. for Fusion Studies). Feb 1982. NTIS (US Sales Only), PC A19/MF A01.

From Spring college on fusion energy; Trieste, Italy (26 May 1981).

Important characters of magnetic field-line reconnection at the singular layer (k.Bsub(0)=0) or the reversed-field region are determined by the plasma compressibility. For a collisionless plasma when it is compressible or with a weak or no toroidal field, the reconnection involves laminar but singular plasma flow around the x-point and is characterized by the collisionless version of the Sweet-Parker process, followed by the second, faster process and/or eventually by the explosive process. When it is incompressible or with a strong toroidal field, the reconnection involves turbulent but nonsingular plasma flow and is characterized by the saturated collisionless tearing instability: the reconnected fluxes slowly increase linearly in time. For a collisional plasma with compressibility, the Sweet-Parker regime is followed by the faster second regime where the reconnected fluxes psi proportional to tsup(α) with α being the ratio of density inside of the singular layer to the outside.

3653 (INIS-mf—7127, pp 45) **Transport phenomena in dc plasmas.** Pfender, E. (Minnesota Univ., Minneapolis (USA). Dept. of Mechanical Engineering). 1981. NTIS (US Sales Only), PC A04/MF A01.

From Workshop on plasma chemistry in technology; Ashkelon, Israel (30 Mar 1981).

3654 (INIS-mf—7127, pp 45) **Energy and mass transport in the interelectrode plasma of a multi-cathode spot vacuum (metal vapor) arc.** Boxman, R.L.; Goldsmith, S. (Tel Aviv Univ. (Israel)). 1981. NTIS (US Sales Only), PC A04/MF A01.

From Workshop on plasma chemistry in technology; Ashkelon, Israel (30 Mar 1981).

3655 (INIS-mf—7188) **Experimental study of influence of high electric potential on plasma focus.** Oppenlaender, T. (Stuttgart Univ. (TH) (Germany, F.R.). Fakultaet Elektrotechnik). 9 Feb 1981. 81p. (In German). NTIS (US Sales Only), PC A05/MF A01. Order Number DE82780812.

Thesis.

As is shown in this work application of high voltages in a plasma focus does not result in basic changes of the discharge characteristic and the plasma focus formation process. Operating points have been found with a neutron yield following the pinch current scaling. The deuteron beam intensity is higher by about a factor of 10 compared with a plasma focus of similar-energy but lower voltage. The use of high voltages presumably favors the beam production mechanisms.

3656 (INIS-SU—110, pp A-1a) **High density discharges with neutral injection in DITE tokamak.** Lomas, P.J.; Axon, K.B.; Bradley, J.E.; Gill, R.D.; Hugill, J.; Johnson, P.C.; Powell, B.A.; Wootton, A.J. (Euratom/UKAEA Fusion Association, Abingdon (UK). Culham Lab.). 1981. NTIS (US Sales Only), PC A11/MF A01.

From 10. European conference on controlled fusion and plasma physics; Moscow, USSR (13 May 1981).

3657 (INIS-SU—110, pp A-1b) **Impurity radiation in DITE during neutral injection.** Clark, W.H.M.; Cordey, J.G.; Cox, M. (Euratom/UKAEA Fusion Association, Abingdon (UK). Culham Lab.). 1981. NTIS (US Sales Only), PC A11/MF A01.

From 10. European conference on controlled fusion and plasma physics; Moscow, USSR (13 May 1981).

3658 (INIS-SU—110, pp A-2) **Energy confinement of high density plasma in the FT tokamak.** Alladio, F.; Bardotti, G.; Bartiromo, R. (European Space Research Inst., Frascati (Italy)). 1981. NTIS (US Sales Only), PC A11/MF A01.

From 10. European conference on controlled fusion and plasma physics; Moscow, USSR (13 May 1981).

3659 (INIS-SU—110, pp A-3b) **Pellet diagnostics experiments in the T-10 tokamak.** Egorov, S.M.; Zhilinsky, A.P.; Kuteev, B.V.; Nikiforov, V.A.; Rozhansky, V.A.; Tsendin, L.D. (Leningradskij Politekhnicheskij Inst. (USSR)); Krupin, V.A. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Atomnoj Ehnergii). 1981. NTIS (US Sales Only), PC A11/MF A01.

From 10. European conference on controlled fusion and plasma physics; Moscow, USSR (13 May 1981).

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From 10. European conference on controlled fusion and plasma physics; Moscow, USSR (13 May 1981).

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From 10. European conference on controlled fusion and plasma physics; Moscow, USSR (13 May 1981).

3662 (INIS-SU—110, pp A-8b) **Plasma properties of the MT-1 tokamak.** Burger, G.; Hrehuss, G.; Kardon, B.; Kostka, P.; Meszaros, Z.; Montvai, A.; Pocs, L.; Szentpetery, I.; Valyi, L. (Koezponti Fizikai Kutato Intezet, Budapest (Hungary)). 1981. NTIS (US Sales Only), PC A11/MF A01.

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3663 (INIS-SU—110, pp A-9) **Peculiarities of the T/sub e/ profile in the T-10 tokamak.** Bobrovskii, G.A.; Vasin, N.L.; Vinogradova, N.D. 1981. NTIS (US Sales Only), PC A11/MF A01.

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3667 (INIS-SU—110, pp A-13) **Transport phenomena investigation in the Tuman-2 tokamak with magnetic compression.** Vil'dzhyunas, M.I.; Gladushchak, V.I.; Goncharov, S.G. (AN SSSR, Leningrad. Fiziko-Tekhnicheskij Inst.). 1981. NTIS (US Sales Only), PC A11/MF A01.

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3668 (INIS-SU—110, pp A-14) **Distribution of the local value of the diffusion coefficient in the FT-1 tokamak based on plasma fluorescence diagnostics.** Burakov, V.S. (AN Azerbajdzhanskoj SSR, Baku. Inst. Fiziki i Matematiki); Misakov, P.Ya.; Naumenkov, P.A.; Folomkin, I.P.; Larionov, M.M.; Razdobarin, G.T.; Semenov, V.V. 1981. NTIS (US Sales Only), PC A11/MF A01.

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3671 (INIS-SU—110, pp A-17) **Particle balance in the T-11 tokamak.** Leonov, V.M.; Merezhkin, V.G.; Mukhovatov, V.S.; Sannikov, V.V. 1981. NTIS (US Sales Only), PC A11/MF A01.

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3672 (INIS-SU—110, pp A-18) **First experiments on the TO-2 tokamak with a divertor.** Artemenkov, L.I.; Grodzinsky, E.V.; Gurov, A.A.; Melikhov, P.I.; Mukhin, P.A.; Papkov, L.N.; Poprjadukhin, A.P.; Shwindt, N.N. 1981. NTIS (US Sales Only), PC A11/MF A01.

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3676 (INIS-SU—110, pp B-11) **Shear effect on stability of ballooning modes in closed magnetic traps.** Mikhailovskii, A.B. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Atomnoj Ehnergii); Demchenko, V.V. 1981. NTIS (US Sales Only), PC A11/MF A01.

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3678 (INIS-SU—110, pp B-14) **Computation of plasma equilibrium in tokamak with iron core.** Dnestrovskij, Yu.N.; Tsaun, S.V. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Atomnoj Ehnergii); Kostomarov, D.P.; Popov, A.M. (Moskovskij Gosudarstvennyj Univ. (USSR)). 1981. NTIS (US Sales Only), PC A11/MF A01.

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3686 (INIS-SU—110, pp C-4) **Energy balance in RFC-XX.** Okamura, S.; Adati, K.; Aoki, T. (Nagoya Univ. (Japan). Inst. of Plasma Physics). 1981. NTIS (US Sales Only), PC A11/MF A01.

From 10. European conference on controlled fusion and plasma physics; Moscow, USSR (13 May 1981).

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From 10. European conference on controlled fusion and plasma physics; Moscow, USSR (13 May 1981).

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From 10. European conference on controlled fusion and plasma physics; Moscow, USSR (13 May 1981).

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3695 (INIS-SU—110, pp C-19) **Interaction of a rotating intense electron beam with a mirror confined plasma.** Jain, K.K.; John, P.I.; Sen, A.; Sundaram, A.K. (Physical Research Lab., Ahmedabad (India)). 1981. NTIS (US Sales Only), PC A11/MF A01.

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3696 (INIS-SU—110, pp D-1) **Ion emission characteristics of plasma focus devices.** Bertalot, L.; Deutsch, R.; Herold, H.; Jager, U.; Mozer, A.; Sadowski, M.; Schmidt, H. (Stuttgart Univ. (TH) (Germany, F.R.). Inst. fuer Plasmaforschung). 1981. NTIS (US Sales Only), PC A11/MF A01.

From 10. European conference on controlled fusion and plasma physics; Moscow, USSR (13 May 1981).

3697 (INIS-SU—110, pp D-2) **Space-resolved investigations on the plasma focus neutron emission.** Hubner, K.; Steinmetz, K. (Heidelberg Univ. (Germany, F.R.). Inst. fuer Angewandte Physikalische Chemie); Rager, J.P. (European Space Research Inst., Frascati (Italy)). 1981. NTIS (US Sales Only), PC A11/MF A01.

From 10. European conference on controlled fusion and plasma physics; Moscow, USSR (13 May 1981).

3698 (INIS-SU—110, pp D-3) **Light scattering in a plasma focus measurement of k- and ω-spectra.** Ehrhardt, J.; Kirchesh, P.; Batzner, R.; Behler, K.; Bockle, G.; Bruhns, H.; Hubner, K.; Stejnmetz, K.; Wenzel, N. (Heidelberg Univ. (Germany, F.R.). Inst. fuer Angewandte Physikalische Chemie). 1981. NTIS (US Sales Only), PC A11/MF A01.

From 10. European conference on controlled fusion and plasma physics; Moscow, USSR (13 May 1981).

3699 (INIS-SU—110, pp D-4) **Study of medium energy ions in a plasma focus device.** Bocandea, A.; Chera, T.; Mandache, N.; Pantea, A.; Zoita, V. (Academia R.S.R., Bucharest (Romania). Inst. de Fizica). 1981. NTIS (US Sales Only), PC A11/MF A01.

From 10. European conference on controlled fusion and plasma physics; Moscow, USSR (13 May 1981).

3700 (INIS-SU—110, pp D-5) **Analysis of energetic particles in dense plasma focus.** Yokoyama, M.; Kitagawa, Y.; Yamada, Y.; Yamanaka, C. (Osaka Univ., Suita (Japan). Faculty of Engineering). 1981. NTIS (US Sales Only), PC A11/MF A01.

From 10. European conference on controlled fusion and plasma physics; Moscow, USSR (13 May 1981).

3701 (INIS-SU—110, pp D-6) **Contraction of plasma in a vacuum spark as a result of radiation losses.** Vikhrev, V.V.; Ivanov, V.V. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Atomnoj Ehnergii); Koshelev, K.N.; Sidelnikov, Y.V. (AN SSSR, Moscow. Inst. Spektroskopii). 1981. NTIS (US Sales Only), PC A11/MF A01.

From 10. European conference on controlled fusion and plasma physics; Moscow, USSR (13 May 1981).

3702 (INIS-SU—110, pp D-7) **Measurements of radial density distributions in the pulsed plasma accelerator interelectrode gap by CO_2-laser interferometry.** Belikov, A.G.; Goncharenko, V.P.; Goncharenko, D.K.; Derepovskij, N.T.; Nikolskij, I.K. (AN Ukrainskoj SSR, Kharkov. Fiziko-Tekhnicheskij Inst.). 1981. NTIS (US Sales Only), PC A11/MF A01.

From 10. European conference on controlled fusion and plasma physics; Moscow, USSR (13 May 1981).

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From 10. European conference on controlled fusion and plasma physics; Moscow, USSR (13 May 1981).

3704 (INIS-SU—110, pp D-9) **Shaping of local high-temperature plasma formation in a powerful pinching discharges.** Bykovsky, U.A.; Lagoda, V.B. (Moskovskij Inzhenerno-Fizicheskij Inst. (USSR)). 1981. NTIS (US Sales Only), PC A11/MF A01.

From 10. European conference on controlled fusion and plasma physics; Moscow, USSR (13 May 1981).

3705 (INIS-SU—110, pp D-10) **REXIMPLO spherical pinch: improved neutron production and 3-d computational analysis.** Panarella, E.; Gupta, R.P. (National Research Council of Canada, Ottawa, Ontario). 1981. NTIS (US Sales Only), PC A11/MF A01.

From 10. European conference on controlled fusion and plasma physics; Moscow, USSR (13 May 1981).

3706 (INIS-SU—110, pp D-11) **Anomalous thermal losses in a high-beta plasma.** Vekstein, G.E. (AN SSSR, Novosibirsk. Inst. Yadernoj Fiziki). 1981. NTIS (US Sales Only), PC A11/MF A01.

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From 10. European conference on controlled fusion and plasma physics; Moscow, USSR (13 May 1981).

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From 10. European conference on controlled fusion and plasma physics; Moscow, USSR (13 May 1981).

3709 (INIS-SU—110, pp D-14) **Determination and evaluation of the parameters of a dense plasma focus using an alternative method.** Sinman, S. (Middle East Technical Univ., Ankara (Turkey)); Sinman, A. 1981. NTIS (US Sales Only), PC A11/MF A01.

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3710 (INIS-SU—110, pp D-15) **Investigation of the breakdown and run-down phases of the dense plasma focus discharge.** Czekaj, S.; Denus, S.; Koziarkiewicz, W.; Nawrot, W.; Skrzeczonowski, W.; Socha, R.; Tomaszewski, K.; Zadrozny, M. (Instytut Fizyki Plazmy i Laserowej Mikrosyntezy, Warsaw (Poland)). 1981. NTIS (US Sales Only), PC A11/MF A01.

From 10. European conference on controlled fusion and plasma physics; Moscow, USSR (13 May 1981).

3711 (INIS-SU—110, pp D-16) **Influence of external B/sub Z/ magnetic field upon the process of creation and disintegration of plasma column in plasma focus device.** Czekaj, S.; Penus, S.; Kasperczuk, A.; Miklaszewski, R.; Paduch, M.; Sledzinski, S.; Wolski, J.; Zadrozny, M. (Instytut Fizyki Plazmy i Laserowej Mikrosyntezy, Warsaw (Poland)). 1981. NTIS (US Sales Only), PC A11/MF A01.

From 10. European conference on controlled fusion and plasma physics; Moscow, USSR (13 May 1981).

3712 (INIS-SU—110, pp D-17) **Investigations of a Z-pinch plasma focus system with pulsed gas filling.** Reshetnyak, N.G.; Meladze, R.D.; Suladze, K.V. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Sukhumi. Fiziko-Tekhnicheskij Inst.). 1981. NTIS (US Sales Only), PC A11/MF A01.

From 10. European conference on controlled fusion and plasma physics; Moscow, USSR (13 May 1981).

3713 (INIS-SU—110, pp D-18) **Mechanism of generation of nonequilibrium particles in dynamical Z-pinches.** Matveev, Yu.V.; Salukvadze, R.G. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Sukhumi. Fiziko-Tekhnicheskij Inst.). 1981. NTIS (US Sales Only), PC A11/MF A01.

From 10. European conference on controlled fusion and plasma physics; Moscow, USSR (13 May 1981).

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From 10. European conference on controlled fusion and plasma physics; Moscow, USSR (13 May 1981).

3715 (INIS-SU—110, pp D-21) **Computational optimization of thermonuclear reaction intensity for Mather's type plasma focus devices.** Jankowicz, L.; Maslowski, A.; Bartosiewicz, Z.; Kalat, J. (Wyzsza Szkola Inzynierska, Bialystok (Poland)); Jerzukiewcz, A.; Rabinski, M. (Institute of Nuclear Research, Warsaw (Poland)). 1981. NTIS (US Sales Only), PC A11/MF A01.

From 10. European conference on controlled fusion and plasma physics; Moscow, USSR (13 May 1981).

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From 10. European conference on controlled fusion and plasma physics; Moscow, USSR (13 May 1981).

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From 10. European conference on controlled fusion and plasma physics; Moscow, USSR (13 May 1981).

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From 10. European conference on controlled fusion and plasma physics; Moscow, USSR (13 May 1981).

3719 (INIS-SU—110, pp E-3) **Equilibrium and stability of a current carrying plasma with three-dimensional magnetic axic (Asperator NP-4).** Funato, Y.; Sakamoto, I.; Takahashi, T.; Kitajima, S.; Ikeda, Y.; Nakazawa, M.; Watanabe, H.; Nagao, S. (Tohoku Univ., Sendai (Japan). Faculty of Engineering). 1981. NTIS (US Sales Only), PC A11/MF A01.

From 10. European conference on controlled fusion and plasma physics; Moscow, USSR (13 May 1981).

3720 (INIS-SU—110, pp E-6) **Plasma confinement in Nagoya Bumpy Torus.** Iguchi, H.; Fujiwara, M.; Hosokawa, M. (Nagoya Univ. (Japan). Inst. of Plasma Physics). 1981. NTIS (US Sales Only), PC A11/MF A01.

From 10. European conference on controlled fusion and plasma physics; Moscow, USSR (13 May 1981).

3721 (INIS-SU—110, pp E-7) **Current profile and plasma transport control under Alfven wave absorption.** Demirkhanov, R.A.; Kirov, A.G.; Ruchko, L.F.; Sukachev, A.V. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Sukhumi. Fiziko-Tekhnicheskij Inst.). 1981. NTIS (US Sales Only), PC A11/MF A01.

From 10. European conference on controlled fusion and plasma physics; Moscow, USSR (13 May 1981).

3722 (INIS-SU—110, pp E-9) **Description of the plasma equilibrium for a high-beta stellarator.** Mikhajlov, M.I.; Shafranov, V.D. 1981. NTIS (US Sales Only), PC A11/MF A01.

From 10. European conference on controlled fusion and plasma physics; Moscow, USSR (13 May 1981).

3723 (INIS-SU—110, pp E-10) **Equilibrium in a stellarator. The pressure limit.** Danilkin, I.S.; Kovriznykh, L.M.; Shchepetov, S.V. 1981. NTIS (US Sales Only), PC A11/MF A01.

From 10. European conference on controlled fusion and plasma physics; Moscow, USSR (13 May 1981).

3724 (INIS-SU—110, pp E-11) **Does the MHD stability determine maximal plasma pressure in a stellarator.** Kovrizhnykh, L.M.; Shchepetov, S.V. 1981. NTIS (US Sales Only), PC A11/MF A01.

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3725 (INIS-SU—110, pp E-12) **Distinquishing feature of plasma heating by high turbulent current in the "Uragan-2" stellarator.** Perepelkin, N.F.; Suprunenko, V.A.; Vasil'ev, M.P. (AN Ukrainskoj SSR, Kharkov. Fiziko-Tekhnicheskij Inst.). 1981. NTIS (US Sales Only), PC A11/MF A01.

From 10. European conference on controlled fusion and plasma physics; Moscow, USSR (13 May 1981).

3726 (INIS-SU—110, pp F-3) **Electron Cherenkov heating under parametric instability in spatially inhomogeneous plasma.** Silin, V.P.; Tikhonchuk, V.T. 1981. NTIS (US Sales Only), PC A11/MF A01.

From 10. European conference on controlled fusion and plasma physics; Moscow, USSR (13 May 1981).

3727 **(JINR-R—9-81-531) Nonlinear equilibrium state of a relativistic electron beam and on electromagnetic wave of large amplitude in a plasma.** Ivanov, S.T.; Reshetnikova, K.A. (Joint Inst. for Nuclear Research, Dubna (USSR). Dept. of New Acceleration Methods). 1981. 11p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82703139.

Using the Maxwell and relativistic hydrodynamics equations, the equilibrium wave-beam state in plasma has been analyzed under assumption that the wave is purely harmonic. Taking into account the momentum and energy preservation laws, the nonlinear characteristics of the system have been obtained for a large wave amplitude (the beam and plasma are nonlinear). Redistribution of the beam kinetic energy and the dependence of the generation efficiency on the parameters of the system have been investigated.

3728 **(Juel—1720) Iron transport in a confined high-temperature plasma.** Demokan, O.; Waelbroeck, F. (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Inst. fuer Plasmaphysik). Jun 1981. 33p. Dep. NTIS (US Sales Only), MF A01. Order Number DE82750231.

The neo-classical flux, GAMMAsub(n.c), of Fe XXIII is calculated for the experimental conditions produced in PLT by using the data on the iron density profiles and the plasma parameters. The actual flux of Fe XXIII, GAMMAsub(c.e), is then evaluated from the continuity equation, by using the same data. GAMMAsub(c.e) is on the average two orders of magnitude larger than GAMMAsub(n.c), the neo-classical prediction. These results are further tested by introducing the neo-classical coefficients which are multiplied by various anomaly factors into the continuity equation and solving for the density profile of Fe XXIII, using the experimental profiles of Fe XXII and Fe XXIV as given. The results of this section indicate that the first and the second terms in the neo-classical flux expression, GAMMAsub(n.c) = $-D_1$ (dn/dr) + D_2n, should be multiplied approximately by the factors (100) and (25), respectively in order to yield the experimentally observed profile of Fe XXIII.

3729 **(LA-UR—82-2892) Tilting mode in field-reversed configurations.** Schwarzmeier, J.L.; Barnes, D.C.; Lewis, H.R.; Seyler, C.E.; Shestakov, A.I. (Los Alamos National Lab., NM (USA)). 1982. Contract W-7405-ENG-36. 12p. (CONF-821059—1). NTIS, PC A02/MF A01. Order Number DE83002067.

From US/Japan workshop on compact toroids; Osaka, Japan (19 Oct 1982).

Portions of document are illegible.

Field Reversed Configurations (FRCs) experimentally have exhibited remarkable stability on the magnetohydrodynamic (MHD) timescale, despite numerous MHD calculations showing FRCs to be unstable. It is easy to believe that local modes are stabilized by finite Larmor radius (FLR) effects, but more puzzling is the apparent stability of FRCs against global modes, where one would expect FLR effects to be less important. In this paper we study the tilting mode, which MHD has shown to be a rapidly growing global mode. The tilting mode in FRCs is driven by the pressure gradient, and magnetic compression and field line bending are the stabilizing forces. A schematic of the evolution of the tilting mode is shown. The tilting mode is considered dangerous, because it would lead to rapid tearing across the separatrix. Unlike spheromaks, the tilting mode in FRCs has a separatrix that is fixed in space, so that the mode is strictly internal.

3730 **(LA-UR—82-2990) Adiabatic invariants for field-reversed configurations.** Schwarzmeier, J.L.; Lewis, H.R.; Seyler, C.E. (Los Alamos National Lab., NM (USA)). 1982. Contract W-7405-ENG-36. 6p. (CONF-821124—1). NTIS, PC A02/MF A01. Order Number DE83002079.

From 5. symposium on physics and technology of compact toroids in the magnetic fusion energy program; Belevue, WA, USA (16 Nov 1982).

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Field reversed configurations (FRCs) are characterized by azimuthal symmetry, so two exact constants of the particle motion are the total particle energy E and the canonical angular momentum P/sub θ/. For many purposes it is desirable to construct a third (diabatic) constant of the motion if this is possible. It is shown that for parameters characteristic of current FRCs that the magnetic moment μ is a poor adiabatic invariant, while the radial action J is conserved rather well.

3731 **(LA-UR—82-2991) Stability model for one-dimensional FRCs.** Schwarzmeier, J.L.; Hewitt, T.G.; Lewis, H.R.; Seyler, C.E.; Symon, K.R. (Los Alamos National Lab., NM (USA)). 1982. Contract W-7405-ENG-36. 5p. (CONF-821124—2). NTIS, PC A02/MF A01. Order Number DE83002078.

From 5. symposium on physics and technology of compact toroids in the magnetic fusion energy program; Belevue, WA, USA (16 Nov 1982).

The subject of transport near the separatrix in FRC devices is important for determining the performance to be expected from an FRC reactor or from FRC experiments. A computer code was constructed for studying the micro-stability properties of FRCs near the separatrix as a first step in obtaining quasilinear transport coefficients that can be used in a transport code. We consider collisionless ions and electrons, without an expansion in powers of a parameter, like the electron or ion gyroradius, and we approximate the equilibrium with an infinitely long axially and translationally symmetric equilibrium. Thus, in our equilibria, there are only an axial magnetic field and a radial electric field. Our equilibria are collisionless, two-species, diffuse-profile, one-dimensional, θ-pinch equilibria. We allow the possibility that there be a magnetic field null in order to be able to model FRC devices more realistically. (MOW)

3732 **(ORNL/TM—8430) Confinement heating and stability in the ELMO Bumpy Torus (EBT).** Uckan, N.A. (Oak Ridge National Lab., TN (USA)). Oct 1982. Contract W-7405-ENG-26. 65p. (CONF-8206124—1). NTIS, PC A04/MF A01. Order Number DE83000470.

From 9. annual conference on plasma physics; Oxford, UK (30 Jun 1982).

The effects of heating methods, stability, neoclassical transport, nonadiabaticity, and ring power balance on the performance of an EBT reactor are discussed. Core plasma beta values in the range 10 to 15% have been estimated, but the reliability and importance of these estimates remain to be determined by future experiments and form a key objective for the EBT Proof-of-Principle (EBT-P) device. Potential variations on the basic EBT configuration that were expected to enhance reactor performance are discussed.

3733 **(ORNL/TM—8436) Approximations to function values and first derivatives from sets of integral-averaged function values.** Arnurius, D.E.; Crume, E.C. Jr. (Oak Ridge National Lab., TN (USA)). Sep 1982. Contract W-7405-ENG-26. 44p. NTIS, PC A03/MF A01. Order Number DE83000471.

Stimulated by the necessity of numerically integrating the one-dimensional, first-order, magnetic-flux-surface-averaged particle continuity equation to study impurity transport in tokamaks, we have investigated how to obtain estimates of functions and their first derivatives correct to second order in the grid spacing for arbitrary grids. Using integral-averaged values with arbitrary weight functions, we readily find two-term linear approximations to the functions that satisfy the accuracy criterion. However, in the case of two-term linear approximations to the first derivative, we find that the grid partition must satisfy a nodal equation to obtain the desired accuracy. When the entire grid cannot be set up to satisfy the nodal equation, transitions involving three-term linear approximations to the derivative are required. We also determine the point between two grid points at which the integral-averaged function value can be identified with the function evaluated at that point. Finally, we give examples of grid selection for two different weight functions: w = 1 and w = r.

3734 **(PPPL—1928) Auxiliary heating results from PDX and PLT.** Davis, S.L. (Princeton Univ., NJ (USA). Plasma Physics Lab.). Sep 1982. Contract AC02-76CH03073. 39p. NTIS, PC A03/MF A01. Order Number DE83001393.

Auxiliary heating experiments are continuing on both PLT and PDX. PLT has increased the available ICRF power delivered to the plasma to 3 MW for the 42 MHz system and to 1.6 MW for the 25 MHz system. Deuteron and electron heating are observed in the minority ^{3}He (T/sub d/ ~ 2.8 keV, T/sub e/ ~ 2.2 keV) and H (T/sub d/ ~ 2 keV, T/sub e/ ~ 2.5 keV) heating regimes. In addition, ion heating has been observed in the second harmonic regime (T/sub eff/ = 2/3 <E/sub h/> = 3.3 keV).

3735 **(PPPL—1944) Ion-beam-driven electrostatic ion cyclotron instabilities.** Miura, A.; Okuda, H.; Ashour-Abdalla, M. (Princeton Univ., NJ (USA). Plasma Physics Lab.). Oct 1982. Contract AC02-76CH03073. 24p. NTIS, PC A02/MF A01. Order Number DE83001396.

We present results of numerical simulations on the electrostatic ion cyclotron instabilities driven by the ion beam parallel to the magnetic field. For the beam speed exceeding the thermal speed of background ions and the beam temperature much lower than the background ion temperature, it is found that the instability results in strong perpendicular heating and slowing down of parallel drift of the beam ions, leading to the saturation of the instability. Applications to plasma heating and space plasma physics are discussed.

3736 **(PPPL—1950) Fusion gamma diagnostics for D-T and D-^{3}He plasmas.** Medley, S.S.; Hendel, H. (Princeton Univ., NJ (USA). Plasma Physics Lab.). Nov 1982. Contract AC02-76CH03073. 28p. NTIS, PC A03/MF A01. Order Number DE83002335.

Nuclear reactions of interest in controlled thermonuclear fusion research often possess a branch yielding prompt emission of gamma radiation. In principle, the gamma emission can be exploited to provide a new fusion diagnostic offering measurements comparable to those obtained by the well established neutron diagnostics methods. The conceptual aspects for a fusion gamma diagnostic are discussed in this paper and the feasibility for application to the Tokamak Fusion Test Reactor during deuterium neutral beam heating of a D-T plasma and minority ion cyclotron resonance heating of a D-^{3}He plasma is examined.

3737 **(SAI—254-82-274-LJ) Anisotropic pressure and finite hot-electron Larmor-radius effects on ring stability.** Tsang, K.T.; Lee, X.S.; Catto, P.J. (Science Applications, Inc., Boulder, CO (USA). Plasma Research Inst.). Sep 1982. Contract AC03-76ET53057. 19p. (PRI—51). NTIS, PC A02/MF A01. Order Number DE83001001.

The effect of the anisotropic pressure of a hot electron plasma on ballooning-interchange and compressional Alfven modes are investigated. General eigenmode equations for these modes are derived in the eikonal limit with finite gyro-radius effects retained. A local dispersion relation is obtained in the flute limit for an isotropic Maxwellian background plasma with a bi-Maxwellian hot electron population. Stability is investigated both analytically and numerically.

3738 **(SAND—82-2016C) Plasma-edge studies using carbon resistance probes.** Wampler, W.R.; Manos, D.M. (Sandia National Labs., Albuquerque, NM (USA); Princeton Univ., NJ (USA). Plasma Physics Lab.). 1982. Contract AC04-76DP00789. 16p. (CONF-821111—7). NTIS, PC A02/MF A01. Order Number DE82022191.

From 29. national symposium on American Vacuum Society; Baltimore, MD, USA (16 Nov 1982).

A new experimental technique, the resistance probe, was used to study the plasma edge in the PLT and PDX tokamaks. This technique involves measuring the change in resistance of a thin carbon film due to bombardment by energetic particles escaping the plasma. The probes have been calibrated by measuring the resistance change caused by implantation of various ions at different energies. A model has been developed which can be used to determine the flux and energy of the incident particles from the measured resistance changes. For probes exposed in PDX and PLT near the wall resistance changes were observed due to charge exchange neutrals. Larger changes were observed in the ion scrape-off region closer to the plasma. In PLT the effect of ions at the plasma edge begins to dominate the neutral flux near the radius of the ring limiter. The energy of ions at the plasma edge was estimated to be low ($\leq$ 100 eV) in PDX during neutral beam heated discharges, but higher ($\geq$ 300 eV) in PLT during ion cyclotron resonance heating.

3739 **(UCRL—53324) Development of a magnetohydrodynamic code for axisymmetric, high-β plasmas with complex magnetic fields.** Cook, G.O. Jr. (Lawrence Livermore National Lab., CA (USA)). Dec 1982. Contract W-7405-ENG-48. 330p. NTIS, PC A15/MF A01. Order Number DE83001917.

Thesis. Submitted to Brigham Young University.

The Topolotron is an axisymmetric, toroidal magnetic fusion concept in which two-dimensional effects are important, as well as all three magnetic field components. The particular MHD model employed is basically the one-fluid, two-temperature model using classical Braginskii transport with viscous effects ignored. The model is augmented by Saha-Boltzmann dissociation and partial ionization physics, a simple radiation loss mechanism, and an additional resistivity due to electron-neutral collisions. While retaining all velocity and magnetic field components, the assumption of axisymmetry is made, and the resulting equations are expanded in cylindrical coordinates. The major approximation technique is then applied: spline collocation, which reduces these equations to a set of ordinary differential equations.

3740 **(UCRL—53327) Transport and equilibrium in field-reversed mirrors.** Boyd, J.K. (Lawrence Livermore National Lab., CA (USA)). Sep 1982. Contract W-7405-ENG-48. 392p. NTIS, PC A17/MF A01. Order Number DE83001915.

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Two plasma models relevant to compact torus research have been developed to study transport and equilibrium in field reversed mirrors. In the first model for small Larmor radius and large collision frequency, the plasma is described as an adiabatic hydromagnetic fluid. In the second model for large Larmor radius and small collision frequency, a kinetic theory description has been developed. Various aspects of the two models have been studied in five computer codes ADB, AV, NEO, OHK, RES. The ADB code computes two dimensional equilibrium and one dimensional transport in a flux coordinate. The AV code calculates orbit average integrals in a harmonic oscillator potential. The NEO code follows particle trajectories in a Hill's vortex magnetic field to study stochasticity, invariants of the motion, and orbit average formulas. The OHK code displays analytic psi(r), B/sub Z/(r), phi(r), E/sub r/(r) formulas developed for the kinetic theory description. The RES code calculates resonance curves to consider overlap regions relevant to stochastic orbit behavior.

3741 **(UCRL—87675-Rev.1) Diagnostics in the hostile environments of a prototype fusion reactor.** Osher, J.E. (Lawrence Livermore National Lab., CA (USA)). 24 Sep 1982. Contract W-7405-ENG-48. 22p. (CONF-820944—2-Rev.1). NTIS, PC A02/MF A01. Order Number DE83000778.

From Workshop on diagnostics for fusion reactor conditions; Varenna, Italy (6 Sep 1982).

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The first lecture begins by reviewing the various facets of a thermonuclear-type plasma that will likely require special considerations or hardening of the applied diagnostic instrumentation. Several factors are necessary to adopt relatively standard plasma diagnostic techniques to function satisfactorily in the more hostile environment of a thermonuclear-type plasma. This lecture contains a listing of the various types of expected hardening requirements for a representative set of diagnostic instrumentation, including both on-line diagnostic instrumentation requirements for satisfactory operation and considerations to reduce integrated radiation damage sufficiently for a reasonable diagnostic lifetime. The second lecture in this series concerns several new diagnostics aimed specifically at measuring the plasma characteristics most appropriate to a thermonuclear-reactor-type plasma. This includes instrumentation needed to make quantitative energy-flow measurements during long-term operation with the expected high-input power sources, and locally very-high-wall power loadings. The second part of this lecture broadens diagnostics to include materials damage measurements needed for engineering design studies. This includes needed diag-

nostic instrumentation to assess first-wall damage, sputtering erosion at the walls (and high-power beam dumps), and radiation damage to components such as insulators.

3742 **Nuclear activation techniques for wall material transport measurements in tokamaks.** Romero, J.B. (Evergreen State Coll., Olympia, WA (USA)); Norem, J.H.; Magill, S.R. (Argonne National Lab., IL (USA). Accelerator Research Facilities Div.). *Nuclear Instruments and Methods in Physics Research;* **198**: No. 2/3, 425-431(15 Jul 1982).

Nuclear activation techniques for the study of transport of wall materials in tokomaks are described. The technique uses post-activation of samples of eroded material collected on the inside surface walls. Quantitative measurements of complex wall materials, such as the stainless steels, are achieved through activation/decay analysis, energy filtering and appropriate cooldown of the irradiated material. In experiments done on the Argonne APEX tokamak, the erosion of manganese from a manganin wire placed a short distance into the plasma edge was measured and found to be quite anisotropic. The results were sensitive to a fraction of a monolayer deposited on a 1 cm^2 sample. The technique is adaptable to studies of tokamak wall material transport and should find applications in other fields as well.

3743 **Excitation of an ion-acoustic wave by two whistlers.** Willett, J.E. (Missouri Univ., Columbia (USA). Dept. of Physics). *Physics Letters [Section] A;* **90**: No. 1/2, 45-47(21 Jun 1982).

The beat frequency excitation of an ion-acoustic wave in a collisional, weakly inhomogeneous plasma by two parallel or anti-parallel beams of circularly polarized electromagnetic waves propagating in the extraordinary model along a uniform, static magnetic field is investigated.

3744 **Overview of the problems connected with theoretical calculations for hot plasmas.** Rozsnyai, B.F. (California Univ., Livermore (USA). Lawrence Livermore National Lab.). *Journal of Quantitative Spectroscopy and Radiative Transfer;* **27**: No. 3, 211-217(Mar 1982).

From Radiative properties of hot dense matter; Monterey, California, USA (17 - 20 Nov 1980).

A brief description is given of the different quantum-mechanical models and approximations used in hot plasma calculations. The subject is elucidated by presentation of computed data for iron and astrophysical plasmas.

3745 **Iron plasma: sensitivity of photoelectric cross sections to different models and general features of the Fermi-Amaldi-modified model.** Shalitin, D.; Ron, A.; Reiss, Y. (Hebrew Univ., Jerusalem (Israel). Racah Inst. of Physics); Pratt, R.H. (Pittsburgh Univ., PA (USA). Dept. of Physics and Astronomy). *Journal of Quantitative Spectroscopy and Radiative Transfer;* **27**: No. 3, 219-226(Mar 1982).

From Radiative properties of hot dense matter; Monterey, California, USA (17 - 20 Nov 1980).

Photoelectric cross sections in several atomic models are presented as a function of temperature and density. The models discussed are Thomas-Fermi (TF), Fermi-Amaldi-Modified (FAM), and Debye-Huckel-Thomas-Fermi (DHTF). Some systematic results are presented for the less known FAM and branching ratios of photoelectric cross sections. The pure iron plasma explored had a temperature in the range of 0.2-3 keV and a density in the range of 50-1000 g/cm^3. It is concluded that except near threshold the photoelectric cross sections per fully occupied subshell are less sensitive to changes in density and temperature, at least in the ranges of the present investigation, than other factors, such as occupation numbers.

3746 **Calculation of free-free gaunt factors for 1 keV electrons in a 1 keV normal density Ce plasma.** Lamoureux, M.; Feng, I.J.; Pratt, R.H.; Tseng, H.K. (Pittsburgh Univ., PA (USA). Dept. of Physics and Astronomy). *Journal of Quantitative Spectroscopy and Radiative Transfer;* **27**: No. 3, 227-231(Mar 1982).

From Radiative properties of hot dense matter; Monterey, California, USA (17 - 20 Nov 1980).

Numerical results are compared for free-free Gaunt factors in a hot dense cesium plasma, obtained in the average atom approximation either with a simple approximate analytic potential or with the finite temperature Thomas-Fermi model. Results are obtained (for the spectrum of radiation from a 1 keV electron incident on a cesium ion in a 1 keV plasma) from an exact numerical calculation in partial waves of the relativistic electron Bremsstrahlung cross section treated as a single electron transition within these potentials. Comparison shows that Born approximation results in the same potentials fail by large factors, especially at the soft photon end of the spectrum.

3747 **Density effects on the spectral emission of a high temperature argon plasma.** Duston, D.; Davis, J. (Naval Research Lab., Washington, DC (USA)). *Journal of Quantitative Spectroscopy and Radiative Transfer;* **27**: No. 3, 267-279(Mar 1982).

From Radiative properties of hot dense matter; Monterey, California, USA (17 - 20 Nov 1980).

In order to explain the detailed features of radiation spectra obtained from dense argon plasmas, an ionization-radiation model for argon has been constructed which calculates time-integrated spectra as a function of plasma temperature, density and size. The model describes a plasma in collisional-radiative equilibrium by solving the time-dependent atomic rate equations for ground state and selected excited state populations of argon coupled with a probability-of-escape radiation transport scheme for both bound-bound and bound-free photons. Results are presented which illustrate basic changes in the X-ray spectra of an argon plasma as density is increased, in particular, relative intensities of resonance, satellite and intercombination lines as well as the free-bound continuum. In addition, temperature and density profiles from 1-D MHD calculations characterizing the peak emission from argon puffed-gas plasmas (approximately 10^{19} $ions/cm^3$) and argon-seeded laser-imploded microballoons (approximately 10^{22} $ions/cm^3$) are post-processed using the model and the resulting spectra are discussed.

3748 **Spectrum diagnostics. The necessity for detailed non-LTE modeling of X-ray emission from dense plasmas.** Whitney, K.G.; Kepple, P.C. (Naval Research Lab., Washington, DC (USA)). *Journal of Quantitative Spectroscopy and Radiative Transfer;* **27**: No. 3, 281-296(Mar 1982).

From Radiative properties of hot dense matter; Monterey, California, USA (17 - 20 Nov 1980).

Broadband Spectrum formation in dense optically thick plasmas is described using an argon K-shell model containing atomic structure up to n = 10 in both hydrogen and helium-like ionization stages as well as lower excited states in the lithium-like system. Lyman series emission is computed along with three prominent satellite lines of the H- and He-Lsub(α) lines and He $1s^2$-$1s2p^3P$ intercombination line. Local Stark profiles are also computed and used for Lsub(α), and Lsub(β) and Lsub(γ) lines of both the hydrogen and helium-like series. The influence of these different line profile assumptions on spectrum formation at high density is discussed in terms of the problems of self-consistently inferring plasma conditions during emission, such as temperature, density, and plasma ionization state. These are considered within the context of post-processing the temperature and density profiles, that are predicted by hydrodynamics calculations of imploded, Argon/DT filled, glass microballoons.

3749 **Dielectric satellite spectra from dense laser-produced plasmas.** Seely, J.F.; Dixon, R.H.; Elton, R.C. (Naval Research Lab., Washington, DC (USA)); Lunney, J.G. (Queen's Univ., Belfast, Northern Ireland (UK)). *Journal of Quantitative Spectroscopy and Radiative Transfer;* **27**: No. 3, 297-306(Mar 1982).

From Radiative properties of hot dense matter; Monterey, California, USA (17 - 20 Nov 1980).

The Lyman-α and adjacent dielectronic satellite lines have been observed in the spectra from laser-irradiated solid targets. In a carbon plasma from a planar target, the relative intensity of the $2p^{2}P$-$1s2p^{3}P$ satellite line of C(V) increases as a function of electron density in the range 8×10^{19} to 2×10^{20} cm^{-3}. As analysis of a series of imploded microballoon experiments indicates that the $2p^{2}P$-$1s2p^{3}P$ and $2s2p^{3}P$-$1s2s^{3}S$ satellite radiation of Si(XIII) in-

creases for electron densities 1 x 10^{22}-2 x 10^{23} cm^{-3}. The satellite intensity distributions have been numerically simulated using a rate equation model. It is shown that the carbon and silicon satellite data may be interpreted in a consistent manner, and the extension to higher atomic numbers Z and higher electron densities is considered.

3750 **Level shifts and inelastic scattering in dense plasmas.** Davis, J. (Naval Research Lab., Washington, DC (USA)); Blaha, M. (Maryland Univ., College Park (USA). Lab. for Plasma and Fusion Energy Studies). *Journal of Quantitative Spectroscopy and Radiative Transfer;* **27**: No. 3, 307-313(Mar 1982).

From Radiative properties of hot dense matter; Monterey, California, USA (17 - 20 Nov 1980).

A completely quantum mechanical formalism has been developed to describe the high density plasma effects on fundamental atomic parameters. Both the bound and free electrons are treated by a method which in principle is similar to Hartree's self-consistent field method. The free plasma electrons' wavefunction is obtained from the Schroedinger equation with the effective potential representing the spherically averaged Coulomb interaction with bound and free electrons. Results are given for level shifts, coefficients of transition probabilities, and electron collision cross sections of Ne^{+9} for temperatures of 200 and 500 eV for an electron density range of 1-6 x 10^{24} cm^{-3}.

3751 **Problems in the use of statistical average atom potentials for estimating average degree of ionization.** Zakowicz, W.; Feng, I.J.; Pratt, R.H. (Pittsburgh Univ., PA (USA). Dept. of Physics and Astronomy). *Journal of Quantitative Spectroscopy and Radiative Transfer;* **27**: No. 3, 329-333(Mar 1982).

From Radiative properties of hot dense matter; Monterey, California, USA (17 - 20 Nov 1980).

Consequences of a simple integral definition of electron charge bound to an ion are examined for Thomas-Fermi (TF) and Debye-Huckel-Thomas-Fermi (DHTF) average atom statistical potentials used to describe high temperature high density plasmas. A self-consistent scheme for calculating average degree of ionization within the DHTF approach is described. With the simple integral definition of bound charge the DHTF model, unlike the TF model, exhibits the anomalous behaviour that degree of ionization can decrease as temperature increases. It is shown that this results from inclusion in the integration of electron charge density too extended and too near continuum energies to be physically considered as bound.

3752 **INFERNO: a better model of atoms in dense plasmas.** Liberman, D.A. (Los Alamos National Lab., NM (USA)). *Journal of Quantitative Spectroscopy and Radiative Transfer;* **27**: No. 3, 335-339(Mar 1982).

From Radiative properties of hot dense matter; Monterey, California, USA (17 - 20 Nov 1980).

A self-consistent field model of atoms in dense plasmas has been devised and incorporated in a computer program. In the model there is a uniform positive charge distribution with a hole in it and at the center of the hole an atomic nucleus. There are electrons, in both bound and continuum states, in sufficient number to form an electrically neutral system. The Dirac equation is used so that high Z atoms can be dealt with. A finite temperature is assumed, and a mean field (average atom) approximation is used in statistical averages. Applications have been made to equations of states and to photoabsorption.

3753 **Binding energies and bound-free transition matrix elements for an impurity atom in a hydrogen plasma.** Feng, I.J.; Pratt, R.H. (Pittsburgh Univ., PA (USA). Dept. of Physics and Astronomy). *Journal of Quantitative Spectroscopy and Radiative Transfer;* **27**: No. 3, 341-343(Mar 1982).

From Radiative properties of hot dense matter; Monterey, California, USA (17 - 20 Nov 1980).

Potentials, energy levels, and bound-free transition matrix elements are obtained for an iron impurity atom in a hydrogen plasma, under varying conditions of density and temperature, according to the Thomas-Fermi (TF) and Debye-Huckel Thomas-Fermi (DHTF) statistical average-atom models. Shape resonance features in the two models are very different.

3754 **Electronic energy-levels in dense plasmas.** More, R.M. (California Univ., Livermore (USA). Lawrence Livermore National Lab.). *Journal of Quantitative Spectroscopy and Radiative Transfer;* **27**: No. 3, 345-357(Mar 1982).

From Radiative properties of hot dense matter; Monterey, California, USA (17 - 20 Nov 1980).

A simple parameterization of pressure ionization is developed, limitations of the Debye-Huckel model for plasma perturbations are discussed, and an approximate description of X-ray spectra based on the WKB approximation is surveyed, for dense plasmas. WKB theory leads to a simple derivation of the screened hydrogenic model for plasma ionization and radiative properties. Electron eigenvalues are obtained from the total ion energy in agreement with Koopman's theorem, and the representation of spectral terms is improved by a new set of screening coefficients.

3755 **Atomic physics issues in fusion.** Post, D.E. (Princeton Univ., NJ (USA). Plasma Physics Lab.). pp 755-767 of Physics of electronic and atomic collisions. Invited papers of the 12th international conference held at Gatlinburg, TN, USA, 15-21 July, 1981. Datz, S. (ed.). Amsterdam, Netherlands; North-Holland (1982).

From 12. IPEAC international conference on the physics of electronics and atomic collisions; Gatlinburg, TN, USA (15 Jul 1981).

Atomic physics issues have played a large role in controlled fusion research. A general introduction to the present role of atomic processes in both inertial and magnetic controlled fusion work is presented.

3756 **Effects of low energy electron capture collisions (H_0 + Csup(n+)) on the particle and energy balance of Tokamak plasmas.** Hogan, J.T. (Oak Ridge National Lab., TN (USA)). pp 769-781 of Physics of electronic and atomic collisions. Invited papers of the 12th international conference held at Gatlinburg, TN, USA, 15-21 July, 1981. Datz, S. (ed.). Amsterdam, Netherlands; North-Holland (1982).

From 12. IPEAC international conference on the physics of electronics and atomic collisions; Gatlinburg, TN, USA (15 Jul 1981).

To illustrate the way in which atomic data provides enlightenment in the search for understandable (and thus extrapolable) confinement models, the scope of the paper is restricted to electron capture collisions involving H_0 and multiply-charged ions. Many such foreign (impurity) multiply-charged ion species are found in plasma discharges, as a result of gas recycling and damage to the surrounding surfaces by energetic plasma particles. Typical 'low-Z' ions are carbon and oxygen; the major constituents of the stainless steel wall (Fe, Ni, Cr) are intermediate impurities, while 'high-Z' impurities (Mo, W) enter from 'limiter' plates which constrict the hot plasma zone to reduce direct plasma-wall contact. In this discussion, however, attention is given only to applications of data involving H_0 + Csup(n+) → H^+ + Csup((n-1)+) reactions with energy 10 eV to 2 keV. This energy range is typical of the plasma edge in present devices.

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REFER ALSO TO CITATION(S) 2142, 2142, 2563, 3278, 3748

3757 **(ANL/FPP/TM—158) Summary of sensor evaluation gor the Fusion ELectromagnetic Induction eXperiment (FELIX).** Knott, M.J. (Argonne National Lab., IL (USA)). Aug 1982. Contract W-31-109-ENG-38. 35p. NTIS, PC A03/MF A01. Order Number DE83002318.

As part of the First Wall/Blanket/Shield Engineering Test Program, a test bed called FELIX (Fusion ELectromagnetic Induction eXperiment) is now under construction at ANL. Its purpose will be to test, evaluate, and develop computer codes for the prediction of electromagnetically induced phenomenon in a magnetic environment modeling that of a fusion reaction. Crucial to this process is the sensing and recording of the various induced effects.

Sensor evaluation for FELIX has reached the point where most sensor types have been evaluated and preliminary decisions are being made as to type and quantity for the initial FELIX experiments. These early experiments, the first, flat plate experiment in particular, will be aimed at testing the sensors as well as the pertinent theories involved. The reason for these evaluations, decisions, and proof tests is the harsh electrical and magnetic environment that FELIX presents.

3758 **(CONF-811040—188) Tokamak-FED plasma-engineering assessments.** Peng, Y.K.M.; Lyon, J.F.; Rutherford, P.H. (Oak Ridge National Lab., TN (USA); Princeton Univ., NJ (USA). Plasma Physics Lab.; Michigan Univ., Ann Arbor (USA); General Atomic Co., San Diego, CA (USA)). 1981. Contract W-7405-ENG-26. 4p. NTIS, PC A02/MF A01. Order Number DE83001883.

From 9. symposium on engineering problems of fusion research; Chicago, IL, USA (26 Oct 1981).

Portions of document are illegible.

A wide range of plasma assumptions and scenarios has been examined for the current US tokamak FED concept, which aims to provide a controlled, long pulse (~ 100 s) burning plasma with an energy amplification of ≧ 5, a fusion power of 180 MW, and a neutron wall load of ≧ 0.4 MW/m². The results of the assessment suggest that the current FED baseline parameters of R = 5.0 m, B/sub t/ = 3.6 T, a = 1.3 m, b = 2.1 m (D-shape), and I/sub p/ = 5.4 MA are appropriate in reaching the above plasma performance, despite uncertainties in several plasma physics areas, such as confinement scaling, achievable beta, impurity control, etc. To enhance the probability of achieving fusion ignition and to provide some margin against a short fall in our physics projections in FED, a limited operating capability at B/sub t/ = 4.6 T and I/sub p/ = 6.5 MA is incorporated. Various other options and remedies have also been assessed aiming to alleviate the impact of the uncertainties on the FED design concept. These approaches appear promising because they can be studied within the current fusion physics program and may lead to drastically more cost-effective FED concepts.

3759 **(CONF-821016—3) Advanced design of positive-ion sources for neutral-beam applications.** Marguerat, E.F.; Haselton, H.H.; Menon, M.M.; Schechter, D.E.; Stirling, W.L.; Tsai, C.C. (Oak Ridge National Lab., TN (USA)). 1982. Contract W-7405-ENG-26. 4p. NTIS, PC A02/MF A01. Order Number DE83001884.

From 9. symposium on engineering problems of fusion research; Chicago, IL, USA (26 Oct 1982).

Portions of document are illegible.

The APIS ion source is being developed to meet a goal of producing ion beams of ≦ 200 keV, 100 A, with 10-30-s pulse lengths. In a continuing effort to advance the state of the art and to produce long pulse ion beams, APIS ion sources with grid dimensions of 10 x 25 cm, 13 x 43 cm, and 16 x 48 cm are being developed. In the past year, the 10- x 25-cm ion source has been operated to produce ion beams in excess of 100 keV for many seconds pulse length. An advanced design concept is being pursued with the primary objectives to improve radiation protection, reduce fabrication costs, and simplify maintenance. The source magnetic sheild will be designed as a vacuum enclosure to house all source components. The electrical insulation requirements of energy recovery are also considered. Because of the frequent maintenance requirements, the electron emitter assembly will be designed with a remote handling capability. A new accelerator design which incorporates the necessary neutron shielding and associated steering gimbal system is also described.

3760 **(DOE/DP/40124—T1) Characteristics of uv laser-matter interaction.** Seka, W.; Goldman, L.M.; Richardson, M.C. (Rochester Univ., NY (USA). Lab. for Laser Energetics). 1982. Contract AC08-80DP40124. 13p. NTIS, PC A02/MF A01. Order Number DE83000014.

Portions of document are illegible.

Experimental results are presented for the interaction of high energy uv (350 nm) lasers with plasmas. The measurements show (1) high absorption efficiency via collisional processes, (2) inhibited thermal transport similar to that observed at longer wavelengths, (3) greatly reduced preheat from fast electrons, and (4) evidence for saturated values of Raman scattering and 2-plasmon decay instabilities. All these results are encouraging for the use of shorter wavelength lasers for inertial fusion.

3761 **(DOE/DP/40148—1) Measurement of electrical quantities in pulse-power systems. Final report. NBS Special Publication 628.** McKnight, R.H.; Hebner, R.E. Jr. (eds.). (National Bureau of Standards, Washington, DC (USA). Center for Electronics and Electrical Engineering). Jun 1982. Contract AI08-81DP40148. 412p. (CONF-810325—). NTIS, PC A18/MF A01. Order Number DE82021322.

From Workshop on measurement of electrical quantities in pulse power systems; Boulder, CO, USA (2 Mar 1981).

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The Workshop on Measurement of Electrical Quantities in Pulse Power Systems addressed measurements in pulse systems having the characteristics of pulse duration less than a millisecond, system voltages greater than 10 kilovolts, and system currents greater than 10 kiloamperes. The presented papers were divided into four categories: voltage measurements, current measurements, power and energy measurements, and data acquisition. Included are discussions of applications of conventional measurement techniques and state-of-the-art systems.

3762 **(DOE/DP/40160—1) Thermal behavior of liquid-metal film exposed to ICF spectra. Annual technical progress report, 10 August 1981-9 August 1982.** Kulcinski, G.L.; Hassanein, A.M.; Croessmann, C.D. (Wisconsin Univ., Madison (USA). Dept. of Nuclear Engineering). Aug 1982. Contract AS08-81DP40160. 21p. NTIS, PC A02/MF A01. Order Number DE83002109.

The A*THERMAL code is used to calculate the temperature rise and subsequent evaporation of a liquid Pb film bombarded with ICF target debris. The usefulness of the A*THERMAL code is demonstrated by the fact that it can handle an arbitrary x-ray spectrum as well as different ion species with Maxwellian or Gaussian distributions of energies. Temperature increases resulting from the various species were combined with vapor pressure data to yield evaporation rates and the subsequent total amount of Pb vaporized from a thermonuclear explosion.

3763 **(DOE/DP/40161—1) Report to Sandia Laboratory on University of Wisconsin fusion-engineering program design activities for the light-ion-beam fusion Target-Development Facility. Final report, August 1981-February 1982.** Badger, B.; Engelstad, R.L.; Hassanein, A.M. (Wisconsin Univ., Madison (USA). Dept. of Nuclear Engineering). Feb 1982. Contract AS08-81DP40161. 169p. (UWFDM—457). NTIS, PC A08/MF A01. Order Number DE83001829.

Portions of document are illegible.

This report is divided into three major parts. Section two is a survey to determine suitable structural materials for the first wall and support frame. Section three is a description of the mechanical design of the first wall and frame. It also includes a discussion of the methods recently developed to analyze the frame's response to the blast overpressure. Section four covers new results in the area of cavity gas dynamics calculations.

3764 **(EGG-M—06882) Potential air-cleaning problems in fusion reactors.** Crocker, J.G. (EG and G Idaho, Inc., Idaho Falls (USA)). 1982. Contract AC07-76ID01570. 9p. (CONF-820833—16). NTIS, PC A02/MF A01. Order Number DE83000559.

From 17. DOE nuclear air cleaning conference; Denver, CO, USA (1 Aug 1982).

The first generation of fusion reactors is expected to produce energy by fusion of deuterium (D) and tritium (T). This fusion reaction produces helium and a 14.1-MeV neutron as reaction products. Tritium is rare in nature and is produced for fusion reactors by reaction of the 14.1-MeV neutron with lithium in a breeding blanket surrounding the reaction chamber. This neutron may also react with materials surrounding the reaction chamber to produce radioactive isotopes in reactor structure materials, coolant streams or building atmosphere. Thus, the principal air cleaning problems involve removal of the radioactive tritium and activation products that may enter the reactor building as a result of normal operation, maintenance or an accident. In addition, some fusion reactor de-

signs contain toxic materials that could potentially be released as a result of a severe accident or fire and should be considered in the design of the air-cleaning system.

3765 (EUR—7425(pt.2), pp 817-830) **Advanced neutral-beam technology.** Berkner, K.H. (University of California, Berkeley (USA)). 1981. NTIS (US Sales Only), PC A25/MF A01.

From 2. joint Grenoble-Varenna international symposium on heating in toroidal plasmas; Como, Italy (3 Sep 1980).

Extensive development will be required to achieve the 50- to 75-MW, 175- to 200-keV, 5- to 10-sec pulses of deuterium atoms envisioned for ETF and INTOR. Multi-megawatt injector systems are large (and expensive); they consist of large vacuum tanks with many square meters of cryogenic pumping panels, beam dumps capable of dissipating several megawatts of un-neutralized beam, bending magnets, electrical power systems capable of fast turnoff with low (capacity) stored energy, and, of course, the injector modules (ion sources and accelerators). The technology requirements associated with these components are described.

3766 (EUR—7425(pt.2), pp 831-847) **New type of neutral injector based on the production of D^- by double electron capture.** Delaunay, M.; Geller, R.; Jacquot, C. (EURATOM-CEA Association, Grenoble (France)). 1981. NTIS (US Sales Only), PC A25/MF A01.

From 2. joint Grenoble-Varenna international symposium on heating in toroidal plasmas; Como, Italy (3 Sep 1980).

The aim of the present paper is to introduce the Swedish French Project and to explain its philosophy and expectations. We compare it to other injectors of the same family and underline the conceptual differences. Let us recall that the D^- ions are obtained through the following reactions: [D_2^+ or D^+ or D^0]+[Cs or Na]→D^-. The best rates are achieved with Cesium (approximately 30%) and incident ions of < 1 keV, but it is difficult to create convenient beams at such low energies. Therefore, sodium cells exhibing less efficiency (approximately 18%) are also utilized, because these rates are achieved with incident particle beams of 10 - 20 keV.

3767 (EUR—7425(pt.2), pp 911-918) **Development of high current, high voltage, long pulse duration ion beams.** Green, T.S. (EURATOM-UKAEA Association, Abingdon, Oxon (United Kingdom)). 1981. NTIS (US Sales Only), PC A25/MF A01.

From 2. joint Grenoble-Varenna international symposium on heating in toroidal plasmas; Como, Italy (3 Sep 1980).

The next generation of neutral injectors (e.g. for JET, 80 kV, 60A, 10 sec) requires continuing developments in each of the basis components for the ion source: (1) large area plasma sources with high proton fraction; (2) water cooled extraction electrode producing high perveance low divergence ion beams; (3) minimisation of powder loading on the extraction electrode. Recent advances in these areas are described.

3768 (EUR—7425(pt.2), pp 919-925) **Advanced, high energy neutral beam injector.** Alessi, J.; Fink, J.; Maschke, A.; Prelec, K.; Sluyters, T. (Brookhaven National Laboratory, Upton, New York (USA)). 1981. NTIS (US Sales Only), PC A25/MF A01.

From 2. joint Grenoble-Varenna international symposium on heating in toroidal plasmas; Como, Italy (3 Sep 1980).

The BNL design of a high energy neutral beam injector is based on the neutralization of negative ions, a process that remains very efficient even at energies up to and above 1 MeV. The principal elements of such an injector are: source of negative ions, beam extraction and transport system, accelerator, neutralizing cell, and system for the removal and dumping (or energy recovery) of the remaining charged components of the beam. Among several possible source geometries, the most advanced is the BNL version of the magnetron. Best results have been obtained by using geometrical focusing of surface produced H^- ions and an asymmetric discharge chamber. A large water cooled model is being fabricated, to deliver 1-2 A of H^-/D^- beam currents in pulses longer than 5 s, with a source power efficiency of about 6 kW/A and a gas efficiency of 6-10%. First tests are scheduled for July 1980. Two options of the beam transport are being studied theoretically and experimentally: a weak focusing bending magnet and a strong focusing chain of electrostatic quadrupoles.

3769 (EUR—7425(pt.2), pp 927-933) **Development of neutral beam injectors for JET at FAR.** Bariaud, A.; Becherer, R.; Desmons, M.; Fumelli, M.; Raimbault, R.; Valckx, F.P.G. (EURATOM-CEA Association, Fontenay-aux-Roses (France)). 1981. NTIS (US Sales Only), PC A25/MF A01.

From 2. joint Grenoble-Varenna international symposium on heating in toroidal plasmas; Como, Italy (3 Sep 1980).

A rectangular version of the periplasmatron ion source capable of illuminating with a homogeneous plasma a 40 x 18 cm^2 extraction area has been constructed at FAR for the need of JET. Intense ion beams up to 40 A, 80 keV energy, 240 mA/cm^2 extracted ion current density, 0,1 sec pulse length have been produced with this source by using an extraction area of 12 x 38 cm^2 and a three electrodes multi-aperture extraction system. The full size JET ion source will be an extrapolated version with an extraction area of 18 x 45 cm^2. The line is now in operation with an electrostatic beam dump, which is under test. Experiments have been carried out, to investigate some phenomena which affects the injector operation like the thermal load of the grids by the acceleration of charged particles created in the accelerating gaps of the beam-forming electrodes and the transmission losses due to the beam divergence.

3770 (EUR—7425(pt.2), pp 935-944) **Production of intense ion beams at 80 keV with a three electrode extraction system.** Raimbault, P.; Fumelli, M.; Becherer, R. (EURATOM-CEA Association, Fontenay-aux-Roses (France)). 1981. NTIS (US Sales Only), PC A25/MF A01.

From 2. joint Grenoble-Varenna international symposium on heating in toroidal plasmas; Como, Italy (3 Sep 1980).

The characteristics of a 3 electrode extraction system with circular apertures, designed and used at FAR laboratory to accelerate ions, for neutral beam injectors, at energies of 80 keV and above, are presented. This system is compared to 4 electrode accelerators with post-acceleration which were thought to be the only alternative at high energies. Higher current densities can be extracted at the optimum perveance and similar beam divergence angles and transmitted power fractions along the beam line can be obtained. The required grid transparency for long pulse operation is identical for both systems. The 3 electrode system offers the additional advantage to be simpler as a mechanical point of view. In particular, the problem of cooling the thin gradient grid is removed. Experimental results on the 3 grid system on the Periplasmatron test beam line are presented at the level of 40 A extracted current at 80 keV beam energy. Numerical simulation results on the 3 grid and 4 grid systems are also given.

3771 (EUR—7425(pt.2), pp 945-951) **Optical diagnosis of a high current beam.** Cottrell, G.A.; Martin, A.R.; Padgett, C. (EURATOM-UKAEA Association, Abingdon, Oxon (United Kingdom)). 1981. NTIS (US Sales Only), PC A25/MF A01.

From 2. joint Grenoble-Varenna international symposium on heating in toroidal plasmas; Como, Italy (3 Sep 1980).

A Fabry-Perot monochromator has been used to measure the optical Balmer alpha radiance of a multi-ampere hydrogen beam at energies up to E=80 keV. Using doppler shifted emission we have obtained species measurements of the three main components in the beam [H^0(E), H^0(E/2) and H^0(E/3)] and an impurity line with mass 18+-1. The angular divergence of each species is related to their individual line widths (by transverse doppler broadening), and we find that the divergences of the H^0(E/2) and H^0(E/3) species are larger than the H^0(E), as expected from the Franck-Condon principle for the collisional break-up energy release of H_2^+ and H_3^+ ions. We discuss a novel method for the measurements of the gas target thickness and the neutral-to-ion ratio in the beam, based on this spectral observation. Observations of the background (unshifted) Balmer alpha light reveal significant broadening which, interpreted as a thermal doppler broadening effect, indicates a hydrogen atom gas temperature of approximately 3 eV. We believe these hot particles are formed by collisional dissociation of cool H_2 by fast beam particles.

3772 (EUR—7425(pt.2), pp 967-972) **Limiting secondary plasma effects in the quest of intense D beams produced by double charge-exchange for D^0 additional heating.** Dolique, J.M.; Zadvorny, F. (Universite Scientifique et Medicale de Grenoble, (France)). 1981. NTIS (US Sales Only), PC A25/MF A01.

From 2. joint Grenoble-Varenna international symposium on heating in toroidal plasmas; Como, Italy (3 Sep 1980).

The intense D^0 beams used for magnetic fusion plasma additional heating, are produced by neutralization of D^+ of D^- beams on a charge-exchange cell. For energies exceeding roughly 100 keV, the efficiency is much better if the primary ions are negative ones. One of the principal methods of producing the D^- ions is a double 10'0'/01'0'/11'1' charge-exchange on a cell of an electropositive gas such as cesium. The secondary plasma gives rise to inelastic reactions which destroy a part of the D^- ions. Production and dynamics of that reactive plasma are studied theoretically in the presence of the beam and also, should there be one, of an axial magnetic field; and further the final D^- efficiency as a function of the physical parameters.

3773 (GA-A—16816) **Annual report to DOE of the General Atomic Company fusion program, fiscal 1981.** Ohkawa, T.; Wesley, J.C. (General Atomic Co., San Diego, CA (USA)). 1981. Contract AT03-76ET51011. 85p. NTIS, PC A05/MF A01. Order Number DE83001162.

Highlights of the following research and developments are given: (1) limiter heat fluxes during plasma disruption; (2) size scaling of energy confinement in ohmically heated Doublet III plasmas; (3) JAERI research results; (4) transport theory of toroidally rotating plasmas; (5) MHD stability of low-q tokamak plasmas; (6) commissioning of the first Doublet III neutral beam injection system; (7) limiter development program; (8) microwave components for ecr heating; (9) radiation hardening of diagnostics for fusion reactors; (10) low-activation fusion; and (11) irradiation study of Li compounds for tritium breeding. (MOW)

3774 (IAE—3408/7) **Fluxes of secondary charged particles in multielectrode ion-optical systems.** Grigor'yan, V.A.; Latyshev, L.A.; Obukhov, V.A.; Panasenkov, A.A.; Semashko, N.N. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Atomnoj Ehnergii). 1981. 12p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82703136.

One of the most important problems in solving the problem of controlled thermonuclear fusion is creation of effective injectors of power fluxes of hydrogen (deuterium) atoms intended for plasma heating up to thermonuclear temperatures. The main element determining basic injector parameters is plasma ion source. The multielectrode ion-optical system (IOS) of such source for 160 keV is studied. Main attension is given to IOS optimization on geometry and potential distribution to decrease electrode energy release. It is shown that in multielectrode IOS with seccessive acceleration proton shaped beams obtaining with energy up to 160 keV at the emission current density of about 0.3 A/cm^2 is possible. Distribution of secondary particle fluxes on IOS electrodes and power released on them depend on relation of electric field strength in cascades. Energy release distribution on electrode jumpers perimeter turns to be essentially nonuniform which should be taken into consideration at their cooling calculations under stationary performance regimes.

3775 (IAE—3415/8) **Tokamak-7 cryogenic system and its test data.** Babaev, I.V.; Bogdanov, V.S.; Butkevich, I.K. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Atomnoj Ehnergii). 1981. 28p. (In Russian). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82703137.

The composition, structure and purpose of the Tokamak-7 device cryogenic system are described. The cryogenic system comprises the helium system and nitrogen cryogenic system. Heat inflows at different temperature levels to cryogenic objects under various modes of the device operation are estimated. The results of the cryogenic system autonomous tests under cooling, cryostating and heating of the T-7 device cryogenic objects are presented. The three year experience of cryogenic system operation for the circulation superconducting magnetic system is accumulated and analysed. Important results necessary for designing cryogenic complexes of newly developed large thremonuclear devices are obtained.

3776 (IAEA-CN—41/Q-3) **Stellarator physics-evaluation studies.** Lyon, J.F.; Carreras, B.A.; Harris, J.H. (Oak Ridge National Lab., TN (USA)). 1982. Contract W-7405-ENG-26. 11p. (CONF-820930—18). NTIS, PC A02/MF A01. Order Number DE82022298.

From 9. international conference on plasma physics and controlled nulcear fusion research; Baltimore, MD, USA (1 Sep 1982).

Portions of document are illegible.

A wide range of stellarator/torsatron configurations is evaluated and compared using vacuum field flux surface topology, MHD equilibrium beta limits and guiding center orbit confinement as optimization criteria. The torsatron is found to be a better choice for a near term physics experiment than the modular stellarator or helical configurations studied. The best torsatron geometry has an equilibrium beta limit of $<\beta> = 4$ to 5% for a plasma aspect ratio of 7 and 7 to 8% for an aspect ratio of 14. A feasible torsatron modularization scheme which retains the physics properties is shown. A wide variety of flux surface geometries can be produced due to the additional flexibility introduced by toroidally-directed windbacks and compensating coils. The effects of different methods of calculating MHD equilibrium/stability, different pressure profiles, and different vertical fields on the results are discussed. Guiding center orbit containment is a less sensitive indicator of configuration quality than is the equilibrium beta limit. Orbits for thermal and fast ions are calculated in field line (flux) coordinates using actual fields and including electric fields, pitch angle scattering and fast ion slowing down.

3777 (IAEA-SMR—82, pp 1-5) **Safety and environmental aspects of fusion reactors.** Kilic, H. (Stevens Inst. of Tech., Hoboken, NJ (USA)); Jensen, B. (Public Service Electric and Gas Co., Newark, NJ (USA)). Feb 1982. NTIS (US Sales Only), PC A19/MF A01.

From Spring college on fusion energy; Trieste, Italy (26 May 1981).

This paper deals with those problems concerning safety and environmental aspects of the future fusion reactors (e.g. fuel cycle, magnetic failure, after heat disturbances, radioactive waste and magnetic field).

3778 (IAEA-SMR—82, pp 7-11) **Advanced fuel cycles.** Momota, H.; Tomita, Y.; Nomura, Y. (Nagoya Univ. (Japan). Inst. of Plasma Physics). Feb 1982. NTIS (US Sales Only), PC A19/MF A01.

From Spring college on fusion energy; Trieste, Italy (26 May 1981).

Parametric studies of operation conditions are carried out and reactor prospects of advanced fuel cycles are examined. It is found that the high-β Catalyzed DD fuel cycle with the transmutation of fusion-produced tritium into helium-3 is most feasible from the point of view of neutron production and tritium handling. D-D fuel cycles seem to be less attractive compared to the Catalyzed DD. The p-^{11}B and p-^{6}Li fusion plasmas hardly attain the plasma Q value relevant to reactors.

3779 (IAEA-SMR—82, pp 13-19) **Plasma assessments for the fusion engineering device (FED).** Peng, Y.K.M.; Lyon, J.F. (Oak Ridge National Lab., TN (USA)); Rutherford, P.H. (Princeton Univ., NJ (USA). Plasma Physics Lab.). Feb 1982. NTIS (US Sales Only), PC A19/MF A01.

From Spring college on fusion energy; Trieste, Italy (26 May 1981).

An initial range of plasma assumptions and scenarios has been examined for the U.S. tokamak FED concept. The results suggest that the current FED baseline parameters of R=4.8 m, Bsub(t)=3.6 T, a=1.3 m, b=2.1 m (D-shape), and Isub(p)=4.8-5.4 MA are appropriate for achieving its nominal goals of P(fusion) approximately equal to 180 MW and a plasma Q approximately >5 for a pulse length greater than 100 s. However, large uncertainty still exists in the areas of current startup, ion-cyclotron wave launching, influence of plasma shape on achievable beta, impurity control, plasma edge transport, and plasma disruption. Various op-

tions and remedies have been suggested to alleviate the impact of the uncertainty on the FED design concept. They appear promising because they can be studied experimentally and are not expected to lead to fundamental design modifications of FED.

3780 (IAEA-SMR—82, pp 29-34) **Simulation experiment on magnetic field reconnection processes in tokamak.** Kiwamoto, Y. (Yokohama National Univ. (Japan)). Feb 1982. NTIS (US Sales Only), PC A19/MF A01.

From Spring college on fusion energy; Trieste, Italy (26 May 1981).

Two experimental studies on magnetic field line reconnection processes relevant to tokamak physics are going on in Japan. In Yokohama National University, reconnection of poloidal magnetic field lines is studied by the author when reversing the toroidal current of a small toroidal plasma in a short period (typically less than 4 μsec). Interaction of two current carrying plasma (linear) columns is being studied by Kawashima and his coleagues in Institute of Space and Aeronautical Sciences. Mutual attraction and merging of the plasma columns and resulting plasma heating are reported.

3781 (IAEA-SMR—82, pp 35-37) **Projections of transport scaling laws for small toroidal reactors.** McNamara, B. (California Univ., Livermore (USA). Lawrence Livermore National Lab.). Feb 1982. NTIS (US Sales Only), PC A19/MF A01.

From Spring college on fusion energy; Trieste, Italy (26 May 1981).

3782 (IAEA-SMR—82, pp 65-71) **Neoclassical ripple transport in tokamaks.** Shaing, K.C.; Callen, J.D. (Wisconsin Univ., Madison (USA). Dept. of Nuclear Engineering). Feb 1982. NTIS (US Sales Only), PC A19/MF A01.

From Spring college on fusion energy; Trieste, Italy (26 May 1981).

The usual ripple transport calculations lead to a nu^{-1} scaling of the transport coefficients with collision frequency nu. This paper extends and clarifies this scaling by taking into account the fact that the dominant contributions to transport come from particles in the high energy tail [E approximately (4-6)T], which restricts the nu^{-1} scaling range to nu(T) > (E/T)sup(5/2)deltaωsub(d)(T) approximately 100 deltaωsub(d)(T). In addition, transport coefficients are derived in the low collisionality regime where the radial step size is determined by the distance a particle drifts before it "collisionlessly detraps" from a ripple well. The maximum transport rate is found to be about two orders of magnitude smaller than usually assumed, primarily because of the restriction of the nu^{-1} scaling regime to the much higher collision frequencies.

3783 (IAEA-SMR—82, pp 73-77) **Experimental study on programming modes in high-beta small tokamak.** Sinman, A. (Ankara Nuclear Research and Training Center (Turkey)); Sinman, S. (Middle East Technical Univ., Ankara (Turkey)). Feb 1982. NTIS (US Sales Only), PC A19/MF A01.

From Spring college on fusion energy; Trieste, Italy (26 May 1981).

In this paper, together with the experimental results on it, a small Tokamak system developed for the aim of to be able to convert from one high-beta reversed-field pinch operating condition to another and to investigate specially the magnetic field configurations are presented. In the case of screw-pinches discharge from the magnetic probe signals, for total temperature of plasma k(Tsub(e)+Tsub(i)), 60-90 eV are calculated. At that time, the electron density of the pinched plasma is about $10^{14}cm^{-3}$. Depending on the operating modes, beta values have varied between 0.14 and 0.30.

3784 (IAEA-SMR—82, pp 95-98) **Tokoloshe: A low aspect ratio tokamak.** de Villiers, J.A.M.; Fletcher, J.D.; Hayzen, A.J.; O'Mahony, J.R.; Roberts, D.E.; Sherwell, D. (Atomic Energy Board, Pelindaba, Pretoria (South Africa)). Feb 1982. NTIS (US Sales Only), PC A19/MF A01.

From Spring college on fusion energy; Trieste, Italy (26 May 1981).

A brief description is given of Tokoloshe, a new low aspect ratio tokamak, which has recently become operational. Some preliminary results are presented.

3785 (IAEA-SMR—82, pp 113-118) **Atomic impurity in a high density plasma.** Das, M.P. (Louisiana State Univ., Baton Rouge (USA). Dept. of Physics and Astronomy). Feb 1982. NTIS (US Sales Only), PC A19/MF A01.

From Spring college on fusion energy; Trieste, Italy (26 May 1981).

We present a self-consistent theory based on the local density functional approach to study the electron structure of an atom imbedded in a high density plasma. We consider a neon atom as an impurity relevant to high compression laser fusion experiments for our analysis and indicate the usefulness of this approach to study level shifts where linear theories like Debye-Hueckel or Thomas-Fermi model will fail.

3786 (IAEA-SMR—82, pp 129-132) **Dependence of ion expansion energy on electron temperature in laser produced plasmas.** Gupta, P.D.; Goel, S.K.; Bhawalkar, D.D. (Bhabha Atomic Research Centre, Bombay (India)). Feb 1982. NTIS (US Sales Only), PC A19/MF A01.

From Spring college on fusion energy; Trieste, Italy (26 May 1981).

Functional dependence of ion expansion energy on electron temperature is obtained for partially ionized plasmas produced by lasers. Effect of changing degree of ionization, varying adiabetic coefficient, fraction of energy absorbed in three dimensional expansion fan and the recombination processes leading to freezing of degree of ionization of plasma during its expansion have been considered in obtaining this dependence. Results of experiments carried out on aluminium targets using a 1GW, 5 n Sec. Nd: glass laser support this functional dependence.

3787 (IAEA-SMR—82, pp 133-136) **Plasma expansion studies in thin layer coated targets.** Gupta, P.D.; Goel, S.K.; Uppal, J.S. (Bhabha Atomic Research Centre, Bombay (India). Laser Section). Feb 1982. NTIS (US Sales Only), PC A19/MF A01.

From Spring college on fusion energy; Trieste, Italy (26 May 1981).

Ion expansion analysis of the plasma produced from targets consisting of thin layers of aluminium on carbon substrates is used to estimate the thickness of the material ablated from the target. Ablation depth for aluminium in the flux range 10^{10}-$3x10^{12}$ w/cm^2 (1GW Nd: glass laser, 5 nsec pulse) is around $1000A^0$ which is consistent with a steady state self regulatory, model for plasma heating. The total kinetic energy carried by the ions is estimated to be nearly 50% of the laser energy. Ion expansion velocity in case of bare targets scales with flux PHI as PHIsup(0.1) and PHIsup(0.35) in low and relatively higher flux range respectively. These variations in scaling which are different from PHIsup(2/9) scaling expected from a self regulatory model and relatively smaller kinetic energy with ions are shown to be occurring as a result of a significant fraction of absorbed laser energy being lost in X-ray emission from plasma.

3788 (IAEA-SMR—82, pp 141-144) **High irradiance studies of laser-produced plasmas.** Krumbein, A.D.; Arad, B.; Eliezer, S. (Israel Atomic Energy Commission, Yavne. Soreq Nuclear Research Center). Feb 1982. NTIS (US Sales Only), PC A19/MF A01.

From Spring college on fusion energy; Trieste, Italy (26 May 1981).

The experimental portion of the laser plasma research program at Soreq is devoted mainly to the study of laser light absorption, plasma energy transport and the development and application of X-ray diagnostics. Experiments were conducted with 1.06 μm laser light pulses produced by either a mode-locked or a Q-switched Nd:YAG oscillator. Both short (60 psec) and long (2.5 nsec) pulses were used in the range of irradiances from 10^{13} to 10^{16} W/cm^2. Low and high atomic number targets were irradiated with π and σ polarized light at both normal and oblique incidence. Results are given for 1) laser reflection and absorption, 2) momentum measurements, 3) electron-ion decay instabilities and 4) X-ray spec-

tra of high atomic number targets. The computational program makes use of a one-dimensional Lagrangian laser-plasma simulation code which includes ionization and a perfect degenerate equation of state. The code is being used to calculate shock waves, pressure and compression in single and double layer targets.

3789 (IAEA-SMR—82, pp 145-154) **Hot electron energy transport and ablation processes in laser plasmas.** Mima, K.; Yabe, T.; Nishihara, K.; Sugiyama, T.; Daido, H.; Fujita, H.; Nakai, S.; Yamanaka, C. (Institute of Laser Engineering, Osaka Univ., Suita, Japan); Kidder, R.E. (California Univ., Livermore (USA). Lawrence Livermore National Lab.). Feb 1982. NTIS (US Sales Only), PC A19/MF A01.

From Spring college on fusion energy; Trieste, Italy (26 May 1981).

Theoretical and computational works have been done on the ablation processes and the heat transport. The objects are the laser intensity and wavelength dependences of the ablation rate and pressure, and the linear and nonlinear analysis of the heat flux driven instabilities. In particular, the hot electron driven ablation and instabilities are investigated. The results are compared with recent experimental observations qualitatively.

3790 (IAEA-SMR—82, pp 175-179) **Investigation of plasma corona dynamics.** Shikanov, A.S.; Sklizkov, G.V.; Zakharenkov, Yu.A. (AN SSSR, Moscow. Fizicheskij Inst.). Feb 1982. NTIS (US Sales Only), PC A19/MF A01.

From Spring college on fusion energy; Trieste, Italy (26 May 1981).

Various methods of experimental study of basic parameters, responsible for efficient acceleration of thin target by the powerful laser radiation are considered. It is demonstrated that plasma corona dynamics turns to be one of the main sources of the necessary data for correct understanding of hydrodynamic processes in laser-produced plasma.

3791 (IAEA-SMR—82, pp 181-186) **Effects of density profile steepening on generation of suprathermal particles, harmonics and magnetic fields in a laser produced plasma.** Stefan, V. (Institut za Nuklearne Nauke Boris Kidric, Belgrade (Yugoslavia)). Feb 1982. NTIS (US Sales Only), PC A19/MF A01.

From Spring college on fusion energy; Trieste, Italy (26 May 1981).

The propagation of obliquely incident p-polarized laser radiation through a laser plasma with a density profile steepening in the domain of the critical point is considered. Such a density profile seems to be a long term profile in a laser produced plasma. It is shown that the structure of the laser radiation electric field is significantly changed in reference to Ginzburg's treatment. In the case of total absorption of the laser radiation a simple expression for the electric field is obtained. The effects of such a new structure of the electric field on the generation of suprathermal particles, harmonics and magnetic fields is considered. It is shown that in this field, ions (due to the ponderomotive force) could be accelerated up to the energies of the order of 10 keV. It is also shown that such a structure of the electric field significantly affects generation of magnetic fields (by the p-component of the laser radiation electric field) in plasma. Finally, it is shown that due to the density profile steepening a direct transformation (as a consequence of parametric instability) of laser radiation into $\omega_0.2^{-1}$ harmonic takes place.

3792 (IAEA-SMR—82, pp 187-192) **EBT-P: The proof of principle experiment for the EBT reactor concept.** Ard, W.B.; Kashuba, R.J. (McDonnell Douglas Corp., St. Louis, MO (USA)). Feb 1982. NTIS (US Sales Only), PC A19/MF A01.

From Spring college on fusion energy; Trieste, Italy (26 May 1981).

The EBT concept, developed principally by R.A. Dandl at ORNL in the early 1970's, employs a high beta electron ring to produce a magnetic well at the surface of a toroidally confined plasma in a simple bumpy torus. The validity of the basic concept was demonstrated in the EBT-I experiment at ORNL in 1974. Further experiments conducted at ORNL and Nagoya University in Japan have established a range of operation in which a quiescent plasma is obtained and have shown that within this range, energy confinement is consistent with neoclassical transport theory. The EBT-P experiment has been designed to extend the operating range to obtain plasma parameters required to determine the transport scaling in the reactor physics regime and to address the question of the stability of the coupled ring-core plasma system with significant core plasma beta (5%). In the expected operating mode of EBT, a negative ambipolar potential is established which governs the confinement in the neoclassical transport regime. This operating range of the present experiment suggests constraints on available EBT plasma performance. The resultant expected performance of the EBT-P experiment is discussed.

3793 (IAEA-SMR—82, pp 255-260) **Omnigenous magnetic fields.** Stupakov, G.V. (AN SSSR, Novosibirsk. Inst. Yadernoj Fiziki). Feb 1982. NTIS (US Sales Only), PC A19/MF A01.

From Spring college on fusion energy; Trieste, Italy (26 May 1981).

In omnigenous magnetic fields particles' drift surfaces coincide with plasma magnetic surfaces. In this paper we formulate equations of omnigenous magnetic fields in natural curvilinear coordinates. An analysis of fields which are omnigenous only in the paraxial approximation is presented.

3794 (IAEA-SMR—82, pp 269-273) **Determination of reference data of REB diodes by using a numerical method for different applications.** Sinman, S. (Middle East Technical Univ., Ankara (Turkey)); Sinman, A. (Ankara Nuclear Research and Training Center (Turkey)). Feb 1982. NTIS (US Sales Only), PC A19/MF A01.

From Spring college on fusion energy; Trieste, Italy (26 May 1981).

In this study, some reference data of a REB diode are presented functionally. These given characteristics are consisted of the computational results. Generally the numerical scheme depends upon the essential parameters of the charged transmission line and Child-Langmuir's diode model. By this system, further the correlation functions, some other definite functions such as the voltage of transmission line Vsub(L)(t), the diode voltage Vsub(d)(t), the diode current Isub(d)(t), the diode impedance Rsub(d)(t), the diode input power Wsub(d)(t), the dissipated energy Usub(d)(t), the efficiency phi, the beam density nsub(b)(t), the relativistic beam energy Usub(b)(t), and the intrinsic impedance Zsub(int)(t) have also been investigated.

3795 (IAEA-SMR—82, pp 289-295) **Review of plasma physics research in Malaysia.** Lee, S. (Malaya Univ., Kuala Lumpur (Malaysia)). Feb 1982. NTIS (US Sales Only), PC A19/MF A01.

From Spring college on fusion energy; Trieste, Italy (26 May 1981).

The energy trends of Malaysia projected for the next few decades are briefly discussed as a background to the rationale for Malaysian research into new forms of energy including plasma fusion. The planning of this research started nearly two decades ago. Today research facilities at PLUM centre on two capacitor banks, one rated at 40 kV, 48 kJ, 2 MA short circuit current and the other at 60 kV, 40 kJ, 2 MA. Other equipment includes several smaller capacitor banks, vacuum systems, oscilloscopes, diagnostic systems, a screened room, a transient digitizer, an Imacon camera and a 100 MW pulsed ruby laser for discharge initiation and diagnostics. The research devices include two plasma focus machines, one vacuum fusion spark, a shock tube and minor experiments like the glow discharge. The main focus facility, the UMDPF1, was designed and built entirely by indigenous effort, using 40 kV capacitors donated by Britain under the Colombo Plan. Difficulties were encountered especially in the need to adapt what is locally available or readily importable to all phases of the design, construction, testing and measurement. Nevertheless, the focus group has achieved the following results: measurement, in 1973, of neutrons produced in the deuterium focus; current, voltage, magnetic field and pressure measurements to interpret plasma dynamics and focus mechanism and to compare with computer simulation of plasma trajectory and configuration; soft X-ray measurements to determine electron temperature; study of the effect on the focus of rotation and multi-

ple ionization up to Argon XVIII; and optimization of focus performance as judged from neutron yield. In 1977 PLUM acquired the Juelich DPF1 which was reassembled as a fast focus, the UMDPF2. This device has been converted to operate as a vacuum spark with the aim of demonstrating the spark as a neutron source when using a deuterided anode. We have measured temperatures of 8 keV in the dense plasma spots.

3796 (IAEA-SMR—82, pp 331-335) **Excitation of currents at the plasma-neutral gas interface and its role in the braking of plasma motion.** Venkataramani, N.; Mattoo, S.K. (Physical Research Lab., Ahmedabad (India)). Feb 1982. NTIS (US Sales Only), PC A19/MF A01.

From Spring college on fusion energy; Trieste, Italy (26 May 1981).

Plasma-neutral gas interaction is characterized by Alfven's critical velocity and there is no such threshold as predicted by Varma. Plasma stream retards far more rapidly than what can be expected from processes of ionisation. A space charge sheath accompanied by a closed current structure is formed during the interaction.

3797 (IAEA-SMR—82, pp 353-357) **Dielectric response of particle-antiparticle plasmas in a magnetic field.** Frankel, N.E.; Hines, K.C.; Kowalenko, V. (Melbourne Univ., Parkville (Australia). School of Physics). Feb 1982. NTIS (US Sales Only), PC A19/MF A01.

From Spring college on fusion energy; Trieste, Italy (26 May 1981).

We have considered the longitudinal dielectric response of an ultra-degenerate relativistic plasma composed of electrons and positrons. We have used the relativistic Hartree self-consistent field method to investigate the dispersion relations and damping parameters of such a plasma in the presence of a magnetic field. These properties must be studied in the various regimes appropriate for a relativistic plasma as detailed by Tsytovich and Jancovici. Although it is hoped that this work will yield new insight into certain astrophysical phenomena (such as pulsars), it is interesting to note that laboratory electron-positron plasmas may be a thing of the immediate future as a result of suggested new experiments using an intense relativistic electron beam.

3798 (IAEA-SMR—82, pp 387-391) **Coalescence of magnetic islands.** Pellat, R. (Ecole Polytechnique, 91 - Palaiseau (France). Centre de Physique Theorique). Feb 1982. NTIS (US Sales Only), PC A19/MF A01.

From Spring college on fusion energy; Trieste, Italy (26 May 1981).

The paper gives the analytical theory of the coalescence instability and of a new, one island, instability. These instabilities are expected to be relevant for the disruptions observed in Tokamak experiments and astrophysical plasmas.

3799 (INIS-mf—7127, pp 45) **Problems of plasma-surface-interaction in controlled fusion devices.** Hintz, E. (Kernforschungsanlage Juelich GmbH (Germany, F.R.). Inst. fuer Plasmaphysik). 1981. NTIS (US Sales Only), PC A04/MF A01.

From Workshop on plasma chemistry in technology; Ashkelon, Israel (30 Mar 1981).

3800 **(INIS-mf—7169) Blankets for fusion reactors: materials and neutronics.** de Carvalho, S.H. (Rio de Janeiro Univ. (Brazil). Coordenacao dos Programas de Pos-graduacao de Engenharia). Mar 1980. 209p. (In Portuguese). NTIS (US Sales Only), PC A10/MF A01. Order Number DE83780013.

Thesis.

The studies about Fusion Reactors have lead to several problems for which there is no general agreement about the best solution. Nevertheless, several points seem to be well defined, at least for the first generation of reactors. The fuel, for example, should be a mixture of deuterium and tritium. Therefore, the reactor should be able to generate the tritium to be burned and also to transform kinetic energy of the fusion neutrons into heat in a process similar to the fission reactors. The best materials for the composition of the blanket were first selected and then the neutronics for the proposed system was developed. The neutron flux in the blanket was calculated using the discrete ordinates transport code, ANISN. All the nuclides cross sections came from the DLC-28/CTR library, that processed the ENDF/B data, using the SUPERTOG Program. (Author).

3801 (INIS-SU—110, pp A-3a) **Investigation of FT-1 tokamak plasma by means of pellet injection.** Zhilinsky, A.P.; Kuteev, B.V.; Mikheikin, S.S.; Nikiforov, V.A.; Rozhansky, V.A. (Leningradskij Politekhnicheskij Inst. (USSR)); Larionov, M.M.; Lebedev, A.D. (AN SSSR, Leningrad. Fiziko-Tekhnicheskij Inst.). 1981. NTIS (US Sales Only), PC A11/MF A01.

From 10. European conference on controlled fusion and plasma physics; Moscow, USSR (13 May 1981).

3802 (INIS-SU—110, pp B-3) **Ideal MHD stability of a force-free magnetic field and the resistive fluid force-free field.** Bineau, M. (CEA Centre d'Etudes Nucleaires de Fontenay-aux-Roses, 92 (France)). 1981. NTIS (US Sales Only), PC A11/MF A01.

From 10. European conference on controlled fusion and plasma physics; Moscow, USSR (13 May 1981).

3803 (INIS-SU—110, pp B-5) **Weak fluidomagnetic equilibria about a surface.** Surdo, C.L. (European Space Research Inst., Frascati (Italy)). 1981. NTIS (US Sales Only), PC A11/MF A01.

From 10. European conference on controlled fusion and plasma physics; Moscow, USSR (13 May 1981).

3804 (INIS-SU—110, pp C-15) **Principal results of theoretical and experimental studies of electromagnetic traps.** Azovskij, Y.S.; Karpukhin, V.I.; Komarov, A.D.; Lavrent'ev, V.A.; Maslov, V.A.; Nozdrachev, M.G.; Sappa, N.N.; Stepanenko, I.A. (AN Ukrainskoj SSR, Kharkov. Fiziko-Tekhnicheskij Inst.). 1981. NTIS (US Sales Only), PC A11/MF A01.

From 10. European conference on controlled fusion and plasma physics; Moscow, USSR (13 May 1981).

3805 (INIS-SU—110, pp C-17) **End loss limitation in a linear theta-pinch by means of magnetic mirrors.** Zukakishvili, G.G.; Salukvadze, R.G.; Tikhanov, E.K.; Ryzhkov, V.N.; Chkuaseli, Z.D. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Sukhumi. Fiziko-Tekhnicheskij Inst.). 1981. NTIS (US Sales Only), PC A11/MF A01.

From 10. European conference on controlled fusion and plasma physics; Moscow, USSR (13 May 1981).

3806 (INIS-SU—110, pp D-22) **Ion beam measurements in cylindrical ion implosion fusion facilities.** Gryzinski, M.; Baranowski, J.; Gorski, E.; Horodenski, A.; Jakubowski, L.; Langner, J.; Sadowski, M.; Skladnik-Sadowska, E.; Zdanowski, K. (Institute of Nuclear Research, Warsaw (Poland)). 1981. NTIS (US Sales Only), PC A11/MF A01.

From 10. European conference on controlled fusion and plasma physics; Moscow, USSR (13 May 1981).

3807 (INIS-SU—110, pp E-4a) **Optimizing the maximum transform for $l = 3$ stellarators by pitch angle winding modulation.** Sharp, L.E.; Blamey, J.W.; Tin, S.K. (Australian National Univ., Canberra. Plasma Research Lab.). 1981. NTIS (US Sales Only), PC A11/MF A01.

From 10. European conference on controlled fusion and plasma physics; Moscow, USSR (13 May 1981).

3808 (INIS-SU—110, pp E-4b) **Effect of winding modulations on the displaced axis of torstarons.** Sy, W.C. (Australian National Univ., Canberra. Research School of Physical Sciences). 1981. NTIS (US Sales Only), PC A11/MF A01.

From 10. European conference on controlled fusion and plasma physics; Moscow, USSR (13 May 1981).

3809 (INIS-SU—110, pp E-8) **Closed magnetic trap with rectilinear sections.** Glagolev, V.M.; Kadomtsev, V.V.; Shafranov, V.D.; Trubnikov, B.A. 1981. NTIS (US Sales Only), PC A11/MF A01.

From 10. European conference on controlled fusion and plasma physics; Moscow, USSR (13 May 1981).

3810 (INIS-SU—110, pp E-14) **Basic study of an open ended non-plasma magnetic axis plasma comfinement system (Asperator NP-01).** Goto, Yu.; Tsuchiya, S.; Nagao, S. (Tohoku Univ., Sendai (Japan). Faculty of Engineering). 1981. NTIS (US Sales Only), PC A11/MF A01.

From 10. European conference on controlled fusion and plasma physics; Moscow, USSR (13 May 1981).

3811 (INIS-SU—110, pp F-1) **Anomalies of laser beam penetration and absorption in the nonuniform plasma above its critical value.** Erokhin, N.S.; Mukhin, V.V.; Novikov, V.E. (AN Ukrainskoj SSR, Kharkov. Fiziko-Tekhnicheskij Inst.); Moiseev, S.S.; Sagdeev, R.Z. (AN SSSR, Moscow. Inst. Kosmicheskikh Issledovanij). 1981. NTIS (US Sales Only), PC A11/MF A01.

From 10. European conference on controlled fusion and plasma physics; Moscow, USSR (13 May 1981).

3812 (INIS-SU—110, pp M-1) **Experimental study of the influence of cathode and collector plasma dynamics on the microwave generator with a relativistic electron beam.** Zajtsev, N.I.; Kovalyov, N.F.; Korablyov, G.S.; Kulagin, I.S. (AN SSSR, Gor'kij. Inst. Prikladnoj Fiziki). 1981. NTIS (US Sales Only), PC A11/MF A01.

From 10. European conference on controlled fusion and plasma physics; Moscow, USSR (13 May 1981).

3813 (IPP—1/192) **Toroidal field magnets for ZEPHYR tape and bitter concepts conductor and insulation materials.** Breit, E.; Brossmann, U.; Gruber, J.E.; Haubenberger, W.D.; Jandl, O.; Kamm, S.; Mast, F.; Mukherjee, S.; Soell, M.; Springmann, E. (Max-Planck-Institut fuer Plasmaphysik, Garching (Germany, F.R.)). Aug 1981. 192p. Dep. NTIS (US Sales Only), MF A01. Order Number DE82750529.

The general design aspects of the Toroidal Field Magnet System for a compact ignition experiment ZEPHYR are discussed. The 17 Tesla field calls for a steel reinforcement of the copper conductor. Two different types of magnet systems, a tape magnet and a Bitter magnet, are possible. In both systems the coils will be arranged in a steel casing. Force transfer is achieved by steel wedges between the coil casings. The mechanical stresses of the magnet structure were calculated by employing finite element methods. The pulse-operated magnet system will be force-cooled by liquid nitrogen to an initial starting temperature of 80 K before each single field pulse is applied. The problems of spacer cooling as well as the finally chosen channel cooling are discussed. The steel-reinforced copper conductor was developed in collaboration with industry, resulting in a high strength (700 N/mm^2) copper/austenite compound. The insulation system consisting of a glass/kapton wrapping of the conductors and of vacuum impregnation with an epoxy resin has to withstand high mechanical loads and a neutron/gamma irradiation in the order of 5 x 10^9 rad. The static and cyclic fatigue strength of different insulation systems at ambient and liquid nitrogen temperature has been investigated in mechanical tests of tension, compression and shear samples. The radiation resistance of the insulation resin was tested with gamma and neutron/gamma irradiation to doses of 10^{10} rad. The aspects of field diffusion in the tape magnet are given in the appendix.

3814 (IPP—2/256) **Net energy balance of tokamak fusion power plants.** Buende, R. (Max-Planck-Institut fuer Plasmaphysik, Garching (Germany, F.R.)). Oct 1981. 19p. (CONF-811046—18). Dep. NTIS (US Sales Only), MF A01. Order Number DE82750532.

From Meeting and workshop on fusion reactor design and technology; Tokyo, Japan (5 Oct 1981).

The net energy balance for a tokamak fusion power plant was determined by using a PWR power plant as reference system, replacing the fission-specific components by fusion-specific components and adjusting the non-reactor-specific components to altered conditions. For determining the energy input to the fusion plant a method was developed that combines the advantages of the energetic input-output method with those of process chain analysis. A comparison with PWR, HTR, FBR, and coal-fired power plants is made. As a result the net energy balance of the fusion power plant turns out to be more advantageous than that of an LWR, HTR or coal-fired power plant and nearly in the same range as FBR power plants.

3815 (IPP—III/71) **Investigation of limiter recycling in the divertor tokamak ASDEX.** Wagner, F. (Max-Planck-Institut fuer Plasmaphysik, Garching (Germany, F.R.)). Aug 1981. 40p. Dep. NTIS (US Sales Only), MF A01. Order Number DE82750531.

A divertor experiment like the ASDEX tokamak is especially suited for studying ion recycling at a material limiter, because the plasma can alternatively be limited by a magnetic limiter (separatrix) or by a material limiter. The role of the material limiter in ion recycling is documented by observing the increase in charge exchange flux emitted at the limiter position, and the decrease in external gas input necessary to keep the plasma line density invariant, when the material limiter is moved to the plasma. Ion recycling occurs predominantly at the outside section of a ring limiter. The limiter material saturates shortly after the start of the discharge. About 60% of the total recycling occurs at the limiter. which is nearly 100% of the ion recycling. The remaining 40% of the total recycling is carried by charge exchange neutrals. Due to saturation, the recycling coefficient at the limiter is 1; the recycling coefficient of the charge exchange neutrals at the wall is approximately 0.5 giving rise to a total recycling coefficient of limiter discharges of 0.8-0.9. It is observed that the plasma resistivity increases when the material limiter is moved toward the separatrix. The increase in Zsub(eff) can tentatively be explained by proton sputtering.

3816 (IPPJ-DT—85) **Dose measurements of x-ray radiation from JIPP T-II device in the vicinity of Water Research Institute, Nagoya University.** Tanahashi, S. (Nagoya Univ. (Japan). Inst. of Plasma Physics). Apr 1981. 12p. (In Japanese). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702548.

Spatial distribution of X-ray doses from JIPP T-II, a hybrid device of tokamak and stellarator at the Institute of Plasma Physics, has been measured with thermoluminescence dosimeter (TLD). The increment in the dose, to which JIPP T-II is responsible, is discriminating from natural doses only at non-shielded regions of the Water Research Institute (WRI) which is located 36 m apart from JIPP T-II device. By controlling the operation of JIPP T-II, an intergrated value of the increment measured with ionization chamber at the windowside of the second floor, WRI, has been kept below 100 μrem during a week, according to the regulation of Nagoya University. The doses at the non-shielded region of WRI are expected to decrease to one-fifth of the present value with a shield (20 mm thick lead panels) which will be completed by the end of February 1981.

3817 (KFK—3202/1) **HIBALL - a conceptual heavy ion beam driven fusion reactor study. Vol. 1.** Badger, B.; El-Guebaly, L.; Engelstad, R.; Hassanein, A.; Klein, A.; Kulcinski, G.; Larsen, E.; Lee, K.; Lovell, E.; Moses, G. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Neutronenphysik und Reaktortechnik). Dec 1981. 318p. (UWFDM—450). Dep. NTIS (US Sales Only), MF A01. Order Number DE82750652.

A preliminary concept for a heavy-ion beam driven inertial confinement fusion power plant is presented. The high repetition rate of the RF accelerator driver is utilized to serve four reactor chambers alternatingly. In the chambers a novel first-wall protection scheme is used. At a target gain of 83 the total net electrical output is 3.8 GW. The recirculating power fraction is below 15%. The main goal of the comprehensive HIBALL study (which is con-

tinuing) is to demonstrate the compatibility of the design of the driver, the target and the reactor chambers. Though preliminary, the present dessign is essentially self-consistent. Tentative cost estimates are given. The costs compare well with those found in similar studies on other types of fusion reactors.

3818 **(KFTI—81-42) Study of the magnetic surface structure in the central region of magnetic configurations of three-turn stellarators and torsatrons.** Kalyuzhnyj, V.N.; Nemov, V.V.; Shishkin, A.A. (AN Ukrainskoj SSR, Kharkov. Fiziko-Tekhnicheskij Inst.). 1981. 30p. (In Russian). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82703140.

Causes of formation of island structure of magnetic surfaces in the central region of magnetic configurations of three-turn stellarators and torsatrons are studied using analytical methods. Possibilities of considerable decrease of such a structure sizes at minimal distortions of magnetic configuration are discussed. Cases of vacuum magnetic configuration and of magnetic configuration at plasma presence as well are considered.

3819 **(KMSF-U—361-Rev.1) Bremsstrahlung radiation from forced oscillation of thermal electrons in a laser electric field.** Mitrovich, D.; Brueckner, K.A.; Segall, S. (KMS Fusion, Inc., Ann Arbor, MI (USA)). 21 Oct 1975. Contract AC08-78DP40030. 19p. (CONF-751130—46-Rev.1). NTIS, PC A02/MF A01. Order Number DE83000035.

From APS meeting; St. Petersburg, FL, USA (10 Nov 1975).

A mechanism is proposed to explain the high energy, athermal component observed in the radiation spectrum of a laser plasma. The mechanism involves increased Bremsstrahlung radiation by electrons oscillating in the electric field of the incident laser beam. The spectrum calculated for a simple one-dimensional model yields flux dependence that appears to be not inconsistent with experimental measurements.

3820 **(KMSF-U—1213) Spherical target experiments at KMS Fusion.** Slater, D.C.; Tarvin, J.A.; Charatis, G.; Rockett, P.D.; Shepard, C.L.; Johnson, R.R.; Larsen, J.T.; Fechner, W.; Berger, R.L. (KMS Fusion, Inc., Ann Arbor, MI (USA)). 1982. Contract AC08-82DP40152. 5p. (CONF-820930—19). NTIS, PC A02/MF A01. Order Number DE83001385.

From 9. international conference on plasma physics and controlled nulcear fusion research; Baltimore, MD, USA (1 Sep 1982).

KMS Fusion is currently performing a set of spherical target experiments designed to evaluate the effectiveness of three techniques for achieving higher convergence implosions. They are: (1) cryogenically frozen fuel layers; (2) submicron wavelength laser light; and (3) temporally tailored pulse shapes. A second set of experiments provides information about energy transport by thermal and suprathermal electrons and uses multilayered targets as an integral component of the diagnostics. These results, in conjunction with existing laser-target coupling data, will provide a very comprehensive test of our understanding of laser plasma interaction, energy transport, and hydrodynamic response of small scale spherical laser fusion experiments.

3821 **(LA—9520-MS) Model of energy confinement in the reversed-field pinch.** Miller, G. (Los Alamos National Lab., NM (USA)). Sep 1982. Contract W-7405-ENG-36. 10p. NTIS, PC A02/MF A01. Order Number DE83002304.

Assuming Rusbridge's Tangled Discharge picture of the reversed-field pinch, a simple parallel transport model describing energy confinement is obtained.

3822 **(LA-UR—82-1504) Operator-machine interface at a large laser-fusion facility.** Sutton, J.G.; Howell, J.A. (Los Alamos National Lab., NM (USA)). 1982. Contract W-7405-ENG-36. 10p. (CONF-821105—1). NTIS, PC A02/MF A01. Order Number DE82015732.

From Asilomar conference; Pacific Grove, CA, USA (8 Nov 1982).

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The operator-machine interface at the Antares Laser Facility provides the operator with a means of controlling the laser system and obtaining operational and performance information. The goal of this interface is to provide an operator with access to the control system in a comfortable way, and to facilitate meeting operational requirements. We describe the philosophy and requirements behind this interface, the hardware used in building it, and the software environment.

3823 **(LA-UR—82-2650) Development of tritium technology at the Tritium Systems Test Assembly.** Anderson, J.L.; Bartlit, J.R. (Los Alamos National Lab., NM (USA)). 1982. Contract W-7405-ENG-36. 9p. (CONF-820948—4). NTIS, PC A02/MF A01. Order Number DE83000667.

From 12. symposium on fusion technology; Juelich, F.R. Germany (13 Sep 1982).

The Tritium Systems Test Assembly (TSTA) at the Los Alamos National Laboratory is dedicated to the development, demonstration, and interfacing of technologies related to the deuterium-tritium fuel cycle for large scale fusion reactor systems starting with the Fusion Engineering Device (FED) or the International Tokamak Reactor (INTOR). This paper briefly describes the fuel cycle and safety systems at TSTA including the Vacuum Facility, Fuel Cleanup, Isotope Separation, Transfer Pumping, Emergency Tritium Cleanup, Tritium Waste Treatment, Tritium Monitoring, Data Acquisition and Control, Emergency Power and Gas Analysis systems. Discussed in further detail is the experimental program proposed for the startup and testing of these systems.

3824 **(LA-UR—82-2994) Technology of compact fusion-reactor concepts.** Krakowski, R.A.; Glancy, J.E.; Dabiri, A.E. (Los Alamos National Lab., NM (USA)). 1982. Contract W-7405-ENG-36. 50p. (CONF-820976—1). NTIS, PC A03/MF A01. Order Number DE83002076.

From National Science Foundation workshop in compact fusion reactors; Washington, DC, USA (30 Sep 1982).

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An identification of future engineering needs of compact, high-power-density approaches to fusion power is presented. After describing a rationale for the compact approach and a number of compact fusion reactors, key technology needs are assessed relative to the similar needs of the conventional tokamak in order to emphasize differences in required technology with respect to the well-documented mainline approaches.

3825 **(NRL-MR—4900) Ballistic pendula for measuring the momentum of a laser-produced plasma.** Grun, J.; Ripin, B.H. (Naval Research Lab., Washington, DC (USA)). 17 Sep 1982. Contract AI08-79DP40092. 13p. NTIS, PC A02/MF A01. Order Number DE83001730.

We describe the use of a ballistic pendulum array to measure the momentum of a laser-produced plasma. An insitu calibration method is described and the pendulum results are compared to measurements made with other diagnostics.

3826 **(ORNL/CSD/TM—177) Computer control of the ISX-B neutral injection beamlines.** Hanna, P.C. (Oak Ridge National Lab., TN (USA)). Sep 1982. Contract W-7405-ENG-26. 21p. NTIS, PC A02/MF A01. Order Number DE83000420.

A system of controls for the Impurity Study Experiment (ISX-B) neutral injection beamlines at the Oak Ridge National Laboratory is presented. The system uses standard CAMAC equipment interfaced to the actual beamline controls and driven by a PDP-11/34 mini-computer. It is designed to relieve the operator of most of the mundane tasks of beam injection and also to reduce the number of operators needed to monitor multiple beamlines.

3827 **(ORNL/Sub—81-21099-1-04) Elmo Bumpy Torus proof of principle, Phase II: Title 1 report. Volume IV. Microwave system. Preliminary design report.** Adams, R.N. (McDonnell Douglas Astronautics Co., St. Louis, MO (USA)). 26 Feb 1982. Contract W-7405-ENG-26. 210p. NTIS, PC A10/MF A01. Order Number DE83001503.

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The EBT-P Microwave System provides microwaves for electron cyclotron resonance heating (ECRH) to both stabilize and

heat the EBT-P plasma. A 28 gigahertz (GHz) system is required to form the hot electron annulus plasma that provides MHD stabilization to the core plasma. A 60 GHz system is required to heat the core plasma and will provide some second harmonic heating of the hot electron annulus. The principal microwave system elements and their design characteristics are summarized. The microwave system includes 200 kilowatt (kW) gyrotrons at 60 GHz for core heating and 200 kW gyrotrons at 28 GHz for annulus heating. The basic operating complement will be six (6) 60 GHz tubes and two (2) 28 GHz tubes. PACE (Plant and Capital Equipment) procurement will include four (4) 60 GHz gyrotrons with two (2) GHz tubes procured under operations and the two (2) 28 GHz tubes will be provided, with mounts, from the EBT-S program. Each tube is rigidly mounted on an oil filled tank assembly which provides electrical isolation and cooling. All tubes and mounts will be located in the lower level of the torus enclosure. An extensive demineralized water flow system is required to provide gyrotron cooling.

3828 **(ORNL/Sub—81-21099-1-07) Elmo Bumpy Torus proof of principle, Phase II: Title 1 report. Volume VII. Cryogenic system.** Poteat, T.J. (McDonnell Douglas Astronautics Co., St. Louis, MO (USA)). 26 Feb 1982. Contract W-7405-ENG-26. 282p. NTIS, PC A13/MF A01. Order Number DE83001501.

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This document, Volume VII EBT-P Cryogenic System Title I Design Report, describes the system that resulted from the Title I Preliminary Design effort. It is a self-contained document that can be read apart from the other Volumes comprising the EBT-P Title I Report. This document is a contract deliverable item and provides the detail necessary to support the Cryogenic System design contained in the EBT-P Baseline Design Data Book (BDDB).

3829 **(ORNL/Sub—81-21099/1-09) Elmo Bumpy Torus proof of principle, Phase II: Title 1 report. Volume IX. Support structure.** Conlee, J.L. (McDonnell Douglas Astronautics Co., St. Louis, MO (USA)). 26 Feb 1982. Contract W-7405-ENG-26. 128p. NTIS, PC A07/MF A01. Order Number DE83001502.

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The EBT-P support structure provides structural support for the 36 mirror coil magnets, magnet protection system, the toroidal vessel, and much of the device ancillary equipment. The structure is comprised of a primary support and a superstructure. The primary support is a reinforced concrete ring located directly inboard of the torus and is supported by nine columns. The toroidal vessel and the mirror coil magnets are cantilevered from the ring with the centerline of the torus located eight feet above the floor. The superstructure is an aluminum truss structure that rests on the concrete ring. The superstructure provides support for the device ancillary equipment. Engineering drawings of the support structure are given.

3830 **(PNL-SA—10300) Radiation damage related to fusion-reactor materials.** Brimhall, J.L. (Pacific Northwest Lab., Richland, WA (USA)). Mar 1982. Contract AC06-76RL01830. 5p. (CONF-820806—4). NTIS, PC A02/MF A01. Order Number DE83002014.

From 40. Electron Microscopy Society of America annual meeting; Washington, DC, USA (9 Aug 1982).

Three reasons why the fusion irradiation environment could produce different damage microstructure will be discussed: (1) the primary damage state induced by a higher energy primary knock-on-spectra; (2) increased helium generation due to high eta, α cross sections; and (3) pulsed operation of the irradiation environment. Examples of the microstructural damage caused by each of the above will be given.

3831 **(PPPL—1922) Analysis of the plasma sweeper.** Glanz, J.; Motley, R.W. (Princeton Univ., NJ (USA). Plasma Physics Lab.). Sep 1982. Contract AC02-76CH03073. 38p. NTIS, PC A03/MF A01. Order Number DE83001392.

The coupling of lower hybrid waves to a plasma can be modified by placing potentials on electrodes near the mouth of a phased array. Positive potentials on the electrodes create an electric field that sweeps the plasma away at a velocity c anti E x anti B/ B^2. In this paper we derive the electric field created by the applied potential from the nondivergent character of the current flow and the ion momentum equation, in which ion-neutral charge-exchange collisions are retained, and we compare the predictions with experimental data.

3832 **(PPPL—1937) Burnup of fusion produced tritons and ^{3}He ions in PLT and PDX.** Heidbrink, W.W.; Chrien, R.E.; Strachan, J.D. (Princeton Univ., NJ (USA). Plasma Physics Lab.). Sep 1982. Contract AC02-76CH03073. 63p. NTIS, PC A04/MF A01. Order Number DE83001391.

The d(d,p)t and d(d,n)^{3}He fusion reactions produce 1 MeV tritons and 0.8 MeV ^{3}He ions which can subsequently undergo d(t,n)α and d(^{3}He,p)α fusion reactions. The magnitude of this triton and ^{3}He ion burnup was measured on the PLT and PDX tokamaks by detection of the 14 MeV neutron and 15 MeV proton emission. In discharges with B/sub phi/ $\geqq$ 2 T, the measured ^{3}He burnup agrees well with predictions based on classical theories of ion confinement and slowing down, while the triton burnup was about four times lower than theoretically predicted. In discharges with weaker toroidal fields, the burnup of both ions fell by more than a factor of ten.

3833 **(PPPL—1942) TFTR neutral-beam power system.** Winje, R.A. (Princeton Univ., NJ (USA). Plasma Physics Lab.). Oct 1982. Contract AC02-76CH03073. 11p. NTIS, PC A02/MF A01. Order Number DE83002295.

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The TFTR Neutral Beam Power System (NBPS) consists of the accelerator grid power supply and the auxiliary power supplies required to operate the TFTR 120-keV ion sources. The current configuration of the NBPS including the 11-MVA accelerator grid power supply and the Arc and Filament power supplies isolated for operation at accelerator grid voltages up to 120 kV, is described. The prototype NBPS has been assembled at the Princeton Plasma Physics Laboratory and has been operated. The results of the initial operation and the description and resolution of some of the technical problems encountered during the commissioning tests are presented.

3834 **(UCID—19359) Physics basis for an axicell design for the end plugs of MFTF-B.** Baldwin, D.E.; Logan, B.G. (eds.). (Lawrence Livermore National Lab., CA (USA)). 21 Apr 1982. Contract W-7405-ENG-48. 239p. NTIS, PC A11/MF A01. Order Number DE83001161.

The primary motivation for conversion of MFTF-B to an axicell configuration lies in its engineering promise as a reactor geometry based on circular high-magnetic-field coils. In comparing this configuration to the previous A-cell geometry, we find a number of differences that might significantly affect the physics performance. The purpose of the present document is to examine those features and to assess their impact on the performance of the axicell, as compared to the A-cell configuration, for MFTF-B. In so doing, we address only those issues thought to be affected by the change in geometry and refer to the original report Physics Basis for MFTF-B, for discussion of those issues thought not to be affected. In Sec. 1, we summarize these physics issues. In Sec. 2, we describe operating scenarios in the new configuration. In the Appendices, we discuss those physics issues that require more detailed treatment.

3835 **(UCID—19562) Physics conceptual design for the MFTF-B transition coil.** Baldwin, D.E.; Bulmer, R.H. (Lawrence Livermore National Lab., CA (USA)). 7 Aug 1982. Contract W-7405-ENG-48. 56p. NTIS, PC A04/MF A01. Order Number DE83000898.

The physics constraints related to finite-β equilibria, β limits due to curvature-driven MHD modes, and ion transport in the central cell. These physics constraints had to be satisfied subject to certain non-physics constraints. Principal among these were the geometric and structural features of the existing MFTF-B magnet set and the required access for neutral beams for pumping. These constraints and their origins are discussed.

3836 (UCRL—15488) Design and fabrication of the superconducting-magnet system for the Mirror Fusion Test Facility (MFTF-B). Tatro, R.E.; Wohlwend, J.W.; Kozman, T.A. (Lawrence Livermore National Lab., CA (USA)). 3 Sep 1982. Contract W-7405-ENG-48. 8p. NTIS, PC A02/MF A01. Order Number DE83000592.

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The superconducting magnet system for the Mirror Fusion Test Facility (MFTF-B) consists of 24 magnets; i.e. two pairs of C-shaped Yin-Yang coils, four C-shaped transition coils, four solenoidal axicell coils, and a 12-solenoid central cell. General Dynamics Convair Division has designed all the coils and is responsible for fabricating 20 coils. The two Yin-Yang pairs (four coils) are being fabricated by the Lawrence Livermore National Laboratory. Since MFTF-B is not a magnet development program, but rather a major physics experiment critical to the mirror fusion program, the basic philosophy has been to use proven materials and analytical techniques wherever possible. The transition and axicell coils are currently being analyzed and designed, while fabrication is under way on the solenoid magnets.

3837 (UCRL—52000-82-10) Energy and technology review. (Lawrence Livermore National Lab., CA (USA)). Oct 1982. Contract W-7405-ENG-48. 50p. NTIS, PC A03/MF A01. Order Number DE83001707.

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This review covers the following three topics: (1) the tandem mirror MFE program, (2) inertial confinement fusion, and (3) energy and resource programs. (MOW)

3838 (UCRL—53106) Physics of laser fusion. Volume II. Diagnostics of experiments on laser fusion targets at LLNL. Ahlstrom, H.G. (Lawrence Livermore National Lab., CA (USA)). Jan 1982. Contract W-7405-ENG-48. 378p. NTIS, PC A17/MF A01. Order Number DE83001711.

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These notes present the experimental basis and status for laser fusion as developed at LLNL. There are two other volumes in this series: Vol. I, by C.E. Max, presents the theoretical laser-plasma interaction physics; Vol. III, by J.F. Holzrichter et al., presents the theory and design of high-power pulsed lasers. A fourth volume will present the theoretical implosion physics. The notes consist of six sections. The first, an introductory section, provides some of the history of inertial fusion and a simple explanation of the concepts involved. The second section presents an extensive discussion of diagnostic instrumentation used in the LLNL Laser Fusion Program. The third section is a presentation of laser facilities and capabilities at LLNL. The purpose here is to define capability, not to derive how it was obtained. The fourth and fifth sections present the experimental data on laser-plasma interaction and implosion physics. The last chapter is a short projection of the future.

3839 (UCRL—87604) Data acquisition and processing system at the NOVETTE laser-fusion facility. Auerbach, J.M.; Severyn, J.R.; Kroepfl, D.J. (Lawrence Livermore National Lab., CA (USA)). 1982. Contract W-7405-ENG-48. 15p. (CONF-821011—10). NTIS, PC A02/MF A01. Order Number DE83001180.

From IEEE nuclear science symposium; Washington, DC, USA (20 Oct 1982).

The computer hardware and software used for acquisition and processing of data from experiments at the NOVETTE laser fusion facility are described. Nearly two hundred sensors are used to measure the performance of millimeter extent targets irradiated by multi-kilojoule laser pulses. Sensor output is recorded on CAMAC based digitizers, CCD arrays, and film. CAMAC instrument outputs are acquired and collected by a network of LSI-11 microprocessors centrally controlled by a VAX 11/780. The user controls the system through menus presented on color video displays equipped with touch panels. The control VAX collects data from all microprocessors and CCD arrays and stores them in a file for transport to a second VAX 11/780 which is used for processing and final analysis. Transfer is done through a high speed fiber-optic link. Relational data bases are used extensively in the processing and archiving of data.

3840 Nonlinear trapped electron mode and anomalous heat transport in tokamaks. Kaw, P.K. (Princeton Univ., NJ (USA). Plasma Physics Lab.). *Physics Letters [Section] A;* **90**: No. 6, 290-292(19 Jul 1982).

We take the phenomenological point of view that the anomalous electron thermal conductivity produced by the nonlinear trapped electron mode should also influence the stability properties of the mode itself. Using a model equation, we show that this effect makes the mode self-stabilizing. A simple expression for the anomalous thermal conductivity is derived, and its scaling properties are discussed.

3841 Argonne plasma engineering experiment (APEX) tokamak. Norem, J.H.; Balka, L.J.; Kulovitz, E.C.; Magill, S.R.; McGhee, D.G.; Moretti, A.; Praeg, W.F. (Argonne National Lab., IL (USA)). *Nuclear Instruments and Methods in Physics Research;* **198**: No. 2/3, 411-423(15 Jul 1982).

The Argonne plasma engineering experiment (APEX) tokamak was designed to provide hot plasmas for reactor-relevant experiments with rf heating (current drive) and plasma wall experiments, principally in situ low-Z wall coating and maintenance. The device sized to produce energetic plasma at minimum cost, is small ($R = 51$ cm, $r = 15$ cm) but capable of high currents (100 kA) and long pulse durations (100 ms). A design using an iron central core with no return legs, pure tension tapewound toroidal field coils, digital radial position control, and UHV vacuum was used. Diagnostics include monochrometers, X-ray detectors, and a microwave interferometer and radiometer for density and temperature measurements. Stable 100 ms shots were produced with electron temperatures in the range 500-1000 eV. Initial results included studies of thermal desorption and recoating of wall materials.

3842 Analysis of titanium coatings deposited and exposed in macrotor and microtor. Keller, L. (California Univ., Los Angeles (USA). Center for Plasma Physics and Fusion Engineering; California Univ., Los Angeles (USA). Dept. of Materials Science and Engineering); Wagner, C.N.J. (California Univ., Los Angeles (USA). Dept. of Materials Science and Engineering); Schwirzke, F. (Naval Postgraduate School, Monterey, CA (USA). Dept. of Physics and Chemistry); Taylor, R.J. (California Univ., Los Angeles (USA). Center for Plasma Physics and Fusion Engineering). *Journal of Nuclear Materials;* **107**: No. 1, 104-116(May 1982).

Metal coatings of Ti are vapor-deposited (200 A/day) in MACROTOR and MICROTOR during low temperature H_2-discharge cleaning and operated far away from the gettering threshold for plasma impurity control. Several methods of analysis (X-ray diffraction, ESCA, AES, SEM) show that after several months of deposition two major effects have an impact on the coating: (a) formation of a porous microstructure which enhances H_2-gas trapping: (b) formation of Ti-hydride of a 100 A crystallite size and with large microstrain present. Both effects are responsible for a mechanically and chemically unstable first wall. H/D-exchange and H-retention are affected most by the existing wall condition. These difficulties may be avoided by using a hot (approx. equal to 400°C) liner.

3843 First wall thermal hydraulic models for fusion blankets. Fillo, J.A. (Brookhaven National Lab., Upton, NY (USA). Dept. of Nuclear Energy). *Nuclear Engineering and Design;* **68**: No. 3, 243-253(Apr 1982).

Subject to normal and off-normal reactor conditions, thermal hydraulic models of first walls, e.g., a thermal mass barrier, a tubular shield, and a radiating liner, are reviewed. Under normal operation the plasma behaves as expected in a predicted way for transient and steady-state conditions. The most severe thermal loading on the first wall occurs when the plasma becomes unstable and dumps its energy on the wall in a very short period of time (milliseconds). Depending on the plasma dump time and the area over which the energy is deposited melting of the first wall surface may result, and if the temperature is high enough, vaporization.

3844 **Natural circulation of electrically conducting liquids in fusion reactor blankets.** Gierszewski, P.J.; Mikic, B.; Todreas, N.E. (Massachusetts Inst. of Tech., Cambridge (USA). Plasma Fusion Center). *Nuclear Engineering and Design;* **68**: No. 3, 255-264(Apr 1982).

A simple model has been developed for heat transfer in fusion reactor blankets with liquid breeding regions, allowing for natural circulation and the presence of strong magnetic fields. The results have been compared with the limited information available. For typical fusion blanket dimensions and temperature differences, natural circulation can be the dominant heat transfer mechanism in the molten salt flibe even over 10 Tesla magnetic field strength; it will increase heat transfer appreciably in the liquid lithium-lead mixture $Li_{17}Pb_{83}$ for magnetic field strengths less than about 10 Tesla; and can be neglected in liquid lithium if the magnetic field is over 1 Tesla.

3845 **New concept for a high-power beam dump.** Moir, R.W.; Hoffman, M.A. (California Univ., Livermore (USA). Lawrence Livermore National Lab.); Taylor, C.E. (California Univ., Berkeley (USA). Lawrence Berkeley Lab.). *Nuclear Engineering and Design;* **68**: No. 3, 265-271(Apr 1982).

A new concept for a dump for the ion and neutral beams used in the controlled nuclear fusion program uses thin sheets of a refractory metal such as tungsten formed into troughts having semicircular cross sections. High-velocity water flowing circumferentially removes heat by subcooled nucleate boiling. Possible advantages are modular construction, relatively long sputtering lifetime, and a lower pressure drop than in tubular beam dumps. An example design calculation is shown for a dump estimated to be capable of absorbing an incident flux of 10 kW/cm^2 with reasonable safety factors.

3846 **Heat transfer in inertial confinement fusion reaction systems.** Hovingh, J. (California Univ., Livermore (USA). Lawrence Livermore National Lab.). *Nuclear Engineering and Design;* **68**: No. 3, 283-291(Apr 1982).

The short time and deposition distance for the energy from inertial fusion products results in local peak power densities on the order of 10^{18} W/m^3. This paper presents an overview of the various inertial fusion reactor designs which attempt to reduce these peak power intensities and describes the heat transfer considerations for each design.

3847 **Thermalhydraulics of flowing particle-bed-type fusion reactor blankets.** Nietert, R.E.; Abdelk-Khalik, S.I. (Wisconsin Univ., Madison (USA). Dept. of Nuclear Engineering). *Nuclear Engineering and Design;* **68**: No. 3, 293-300(Apr 1982).

An experimental investigation has been conducted to determine the heat transfer characteristics of gravity-flowing particle beds using a special heat transfer loop. Glass microspheres were allowed to flow by gravity at controlled rates through an electrically heated stainless steel tubular test section. Values of the local and average convective heat transfer coefficient as a function of the average bed velocity, particle size and heat flux were determined. Such information is necessary for the design of gravity-flowing particle-bed type fusion reactor-blankets and associated tritium recovery systems.

3848 **Heating of cryogenic targets in a light ion fusion cavity.** Cook, D.L.; Sweeney, M.A. (Sandia National Labs., Albuquerque, NM (USA)). *Nuclear Engineering and Design;* **68**: No. 3, 301-309(Apr 1982).

Survivability of cryogenic targets in single-shot and reactor cavity environments is an essential prerequisite for high gain (>25) target experimentation, target development, and power production. Heat sources in a gas-filled light ion beam cavity include radiative, convective, and viscous heating by the cavity fill gas, heating due to laser radiation used to initiate low-density plasma channels for beam propagation, and heating due to ohmic due to ohmic dissipation of channel currents near the target. Prior to injection of the target into the cavity, tritium decay and target acceleration are the sources of heat. In this paper the parametric dependence, time scale, and magnitude of each of these thermal sources are discussed. Potential thermal protection techniques which may be applicable to long (>0.1 s), intermediate (approx. equal to ms), and short-duration (approx. equal to μs) heat loads are described, and remaining concerns are noted.

3849 **Test program on thermomechanical and thermal-hydraulic aspects of nuclear systems for magnetically confined fusion power reactors.** Nygren, R.E.; Herman, H.; Baker, C.C. (Argonne National Lab., IL (USA). Fusion Power Program). *Nuclear Engineering and Design;* **68**: No. 3, 311-321(Apr 1982).

The First Wall/Blanket/Shield Engineering Test Program (FW/B/S Program), is a broadly based program aimed at developing engineering technology for fusion. Roughly half of the program is devoted to thermo-mechanical and thermal-hydraulic testing. The facilities, test plans and general strategy for this part of the program are reviewed with emphasis on the electron beam facilities being used to apply surface heat loads to test heat rejection panels and on the generic issues in fusion blanket technology targeted for investigation and in particular, heat transfer from solid tritium breeding compounds.

3850 **2-D model of plasma-jet interaction in the HYLIFE inertial confinement fusion reactor.** Glenn, L.A. (California Univ., Livermore (USA). Lawrence Livermore National Lab.). *Nuclear Engineering and Design;* **69**: No. 1, 75-85(Apr 1982).

A two-dimensional, axisymmetric model was developed to study the impulsive crossflow of a lithium plasma through a close-packed annular arrangement of liquid jets, a problem that arises in the design of a certain class of inertial confinement fusion reactors. Calculations performed with this model indicate that a 5 m radius reactor cavity, standing 8 m high, can deliver 1 GWe when pulsed at 1 Hz, without adverse loading of the first wall.

3851 **Stark broadening in hot, dense, laser-produced plasma: a review.** Woltz, L.A.; Iglesias, C.A.; Hooper, C.F. Jr. (Florida Univ., Gainesville (USA). Dept. of Physics). *Journal of Quantitative Spectroscopy and Radiative Transfer;* **27**: No. 3, 233-242(Mar 1982).

From Radiative properties of hot dense matter; Monterey, California, USA (17 - 20 Nov 1980).

A general expression for a line profile previously derived (Husey et al. Phys. Rev.; A12:1084 (1975)) is analyzed and approximations that are frequently made for calculations appropriate for plasma conditions created in pellet implosion experiments are discussed. Two aspects of the calculations will be stressed: (a) electric microfield distribution functions, (b) full-Coulomb electron-radiator interactions.

3852 **Potential for using rapid solidification for improved irradiation performance in the fusion environment.** Megusar, J.; Harling, O.K.; Grant, N.J. (Massachusetts Inst. of Tech., Cambridge (USA). Dept. of Materials Science and Engineering; Massachusetts Inst. of Tech., Cambridge (USA). Nuclear Reactor Lab.). *Journal of Nuclear Materials;* **104**: No. 1-3, 961-966(Mar 1982).

From 2. topical meeting on fusion reactor materials; Seattle, WA, USA (9 - 12 Aug 1981).

Rapid solidification has a potential for improving performance in the fusion environment (first-wall materials, limiters, superconductors, ...) through structural refinements of crystalline materials and the preparation of amorphous materials with selected compositions. Compaction techniques which are used for rapidly solidified particulates allow as well for preparation of graded or layered materials. The following topics are being studied by using rapid solidification under a current M.I.T. alloy development program: swelling resistance and high temperature strength of austenitic stainless steels; DBTT and high-temperature strength of ferritic steels; high strength copper alloys; simulation techniques (boron, lithium doping); irradiation damage in metallic glasses at high fluences.

3853 Interaction of helium and displacement damage in inertial confinement fusion reactors. Schafer, R.F. Jr.; Ghoniem, N.M. (California Univ., Los Angeles (USA). School of Engineering and Applied Science). *Journal of Nuclear Materials;* **104**: No. 1-3, 1457-1462(Mar 1982).

From 2. topical meeting on fusion reactor materials; Seattle, WA, USA (9 - 12 Aug 1981).

Helium is thermodynamically insoluble in metals and tends to form cavities if the conditions are appropriate for its migration. The processes of helium migration and interaction with point defects are strongly influenced by the level and the mode of displacement damage production. In this paper, we present an application of the rate theory for helium cavity formation in Inertial Confinement Fusion Reactors (ICFR's). A new computer code 'EXPRESS' have been developed for the solution of the time-dependent rate equations describing the evolution of the space-averaged damage state of an ICFR first wall. An optimal algorithm was developed for the long-term solution of the rate equations (10^5 pulses) with modest computational requirements. It is shown that the time-fluctuations in point defect and helium concentrations due to ICF-type pulsing lead to an overall reduction in the swelling of ICF materials.

3854 Enhancement of irradiation creep in pulsed fusion reactors. Gurol, H. (California Univ., Santa Barbara (USA). Dept. of Chemical and Nuclear Engineering); Ghoniem, N.M. (California Univ., Los Angeles (USA). School of Engineering and Applied Science); Wolfer, W.G. (Wisconsin Univ., Madison (USA). Dept. of Nuclear Engineering). *Journal of Nuclear Materials;* **104**: No. 1-3, 1251-1256(Mar 1982).

From 2. topical meeting on fusion reactor materials; Seattle, WA, USA (9 - 12 Aug 1981).

A design correlation for creep in pulsed fusion reactors is formulated, by using a breeder based design equation. The design equation for fusion reactors differs from the breeder equation by a multiplicative enhancement factor, Fsub(p). Fsub(p) has been calculated for a wide range of microstructural and pulsing parameters. It is found that irradiation pulsing can lead to significant creep enhancements in long burn-time Tokamaks, whose first wall microstructure is characterized by mean vacancy lifetimes tausub(v) approx. <= pulse on-time, and off-time. For example, for a realistic duty factor of 0.9, the enhancement lies between about 2 and 3, depending on whether dose-equivalent averaged, or instantaneous damage rates are used.

3855 Thermal control of the MFTF superconducting magnet. Van Sant, J.H. *Energy and Technology Review;* 14-19(May 1981).

The 300 ton superconducting magnet for the Lawrence Livermore National Laboratory Mirror Fusion Test Facility (MFTF) is discussed that is scheduled for testing in 1981. It is expected to produce strong magnetic fields at modest energy costs by means of design features including liquid-helium cooling to produce the low temperatures required to make superconductors of the windings, insulation from heat sources, and protection in the event of a magnet quench. The design and test results are expected to provide information that is needed to design the larger 22-coil system for the MFTF-B which is to be operational in 1985.

3856 Compatibility of Fe-Cr-Mo alloys with static lithium. Tortorelli, P.F.; Devan, J.H.; Yonco, R.M. (Oak Ridge Natl Lab, Tenn, USA). *Journal of Materials for Energy Systems;* 2: No. 4, 5-15(Mar 1981).

The interactions between 2/one quarter/ Cr-1 Mo steel and Standvik HT9 and static lithium were studied by means of weight changes, tensile properties, carbon concentrations in the lithium, and optical metallography. The principal result was decarburization of 2/one quarter/ Cr-1 Mo steel particularly at the highest exposure temperature (600 /degree/C). HT9 did not decarburize under 500 /degree/C exposure conditions. In addition to chromium content, carbon transfer depends on the exposure temperature and the initial heat treatment. Exposure of 2/one quarter/ Cr-1 Mo steel to Li-5 wt pct Al caused the steel to lose tensile ductility. 13 refs.

3857 Lithium purity and characterization. Meadows, G.E.; Keough, R.F. (Hanford Eng Dev Lab, Richland, Wash, USA). *Journal of Materials for Energy Systems;* 2: No. 4, 44-49(Mar 1981).

Lithium analysis has been performed in support of the operation of the Experimental Lithium System (ELS), a facility constructed to test components for the Fusion Materials Irradiation Test (FMIT) Project. In addition, the analysis and purification of navy surplus ingot lithium which is being considered for use in a larger system is discussed. The analytical techniques used are summarized and the results of a round robin lithium analysis are presented.

3858 Contribution of activation products to fusion accident risk. I - A preliminary investigation. Holdren, J.P. (California University, Berkeley and Livermore, CA). *Nuclear Technology/Fusion;* 1: 79-89(Jan 1981).

The health hazards of activation products from fusion-reactor accidents are dealt with in a study on an early conceptual tokamak reactor, using a simple consequence model based on that of the Nuclear Regulatory Commission's Reactor Safety Study (the Rasmussen Report) in order to determine conceivable radiation doses near the plant boundary. Though tritium releases appear to result in fewer casualties than those predicted for the most severe accidents in fission reactors of similar electrical-generating capacity, the boundary doses of stainless-steel and molybdenum structures subject to massive lithium fires are comparable to the doses similarly calculated for 'worst case' light water reactor accidents. Calculations and tables are given for major activation products, their stored energy and their boundary doses in severe fusion and fission accidents. Remedies are suggested for greatly reducing the potential for activation product release from fusion reactors, such as the use of low activation materials, the reduction of stored energy by putting lithium in relatively non-reactive form and the use of deuterium-deuterium instead of D-T reactions.

3859 Neutronics shielding analysis of the last mirror-beam duct system for a laser fusion power reactor. Ragheb, M.M.H. (Illinois, University, Urbana, Ill.); Klein, A.C. (Wisconsin, University, Madison, Wis.). *Nuclear Technology/Fusion;* 1: 99-119(Jan 1981).

A Monte Carlo three-dimensional neutronics analysis for the last mirror-beam duct system for the SOLASE conceptual laser-driven fusion power reactor design is presented. Detailed geometric configurations including the reactor cavity, the two last mirrors, and the three-section two-right-angle bends duct are modeled. Measurements are given of the dimensions and compositions of the reactor components, and of neutron scalar fluxes, spatial dependencies and neutron volumetric heating rates for the cases of aluminum or Boral as laser beam duct liners, and ordinary concrete or lead mortar as shield material. A three-dimensional modeling of laser-driven reactor penetrations is employed. The particle leakage is found to be excessively high for the configuration of the conceptual design considered and the advantages and disadvantages of various solutions, such as the use of Boral as a duct liner and the use of lead mortar instead of ordinary concrete as a shield material, are considered.

3860 Perspectives and some recent developments concerning declassification of the inertial confinement fusion (ICF) program. Harrach, R.J. (Lawrence Livermore Natl Lab, CA, USA). *Energy Communications;* 7: No. 2, 189-196(1981).

Of the United States' two major research and development programs pursuing the goal of fusion energy production, the magnetic confinement fusion energy (MFE) program was removed from security classification restrictions in 1958, whereas the inertial confinement fusion (ICF) program remains classified in part, with concomitant barriers to information flow and scientific cooperation both internationally and intranationally. This report attempts to put the question of ICF classification in perspective, and to review and remark upon especially to an appeal by Ray Kidder for ICF declassification. 16 refs.

3861 **MFTF supervisory control system.** *Energy and Technology Review;* 27-33(Dec 1980).

A computerized supervisory control system is being developed for the Mirror Fusion Test Facility. The system includes nine Perkin-Elmer 7/32 and 8/32 computers connected by a block of common core memory (128 kilobytes). The network is a disk designed for reliability and redundancy. If one computer goes down, the local-control micro-processors that it controls are switched to another computer in a matter of seconds. The control consoles permit operators to open and close valves, start or stop pumps, and adjust operating levels. The experiment is controlled by two superconsoles and five satellite consoles. The software, written in PASCAL, contains such subsystems as organizing the computers into a network, operating the consoles and accessing the data base.

3862 **New concept for a high-power beam dump.** Moir, R.W.; Taylor, C.E. (California Univ., Livermore). *American Society of Mechanical Engineers, [Paper];* No. 80-HT-140, 1-5(Jul 1980). (CONF-800723—). Contract W-7405-ENG-48.

From 19. national heat transfer conference; Orlando, FL, USA (27 Jul 1980).

A new concept for a dump for the ion and neutral beams used in the controlled nuclear fusion program uses thin sheets of a refractory metal such as tungsten formed into troughs having semicircular cross sections. High-velocity water flowing circumferentially removes heat by subcooled nucleate boiling. Possible advantages are modular construction, lower water-pumping power, and a lower pressure drop than in conventional beam dumps. An example design calculation is shown for a dump capable of absorbing an incident flux of 10 kW/sq cm.

3863 **Alignment accuracy at the Helios CO_2 laser.** Liberman, I.; Benjamin, R.F. (California, University, Los Alamos, N. Mex.). *Proceedings of the Society of Photo-Optical Instrumentation Engineers;* 67-74(1979). (CONF-790418—).

From Scanning electron microscopy conference; Washington, DC, USA (16 Apr 1979).

The accuracy with which beams from the LASL eight-beam CO_2 laser, Helios, can be centered onto a fusion target has been measured. The average pointing error of 34 microns is adequate for initial high-power experiments. The technique is rapid and accurately simulates the conditions of actual target experiments.

3864 (INIS-mf—6937, pp vp) **Propagation of a burn wave in a laser fusion target.** Rosenblum, M.; Krumbein, A.D. (Israel Atomic Energy Commission, Yavne. Soreq Nuclear Research Center). [nd]. NTIS (US Sales Only), PC A14/MF A01.

From Israel Nuclear Societies joint annual meeting; Beer-shaba, Israel (4 Dec 1980).

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3865 **(ANL—82-23) Chemical Engineering Division annual technical report, 1981.** (Argonne National Lab., IL (USA)). Apr 1982. Contract W-31-109-ENG-38. 219p. NTIS, PC A10/MF A01. Order Number DE82019248.

Portions of document are illegible.

Highlights of the Chemical Engineering (CEN) Division's activities during 1981 are presented. In this period, CEN conducted research and development in the following areas: (1) rechargeable lithium-alloy/iron sulfide batteries for electric vehicles and other applications; (2) aqueous batteries - improved lead-acid, nickel/zinc, and nickel/iron - for electric vehicles, as well as advanced lead-acid batteries for electric-utility load leveling; (3) energy-efficient industrial electrochemical processes; (4) molten carbonate fuel cells for use by electric utilities; (5) coal technology, mainly fluidized-bed combustion of coal in the presence of an SO_2 sorbent of limestone; (6) heat- and seed-recovery technology for open-cycle magnetohydrodynamic systems; (7) solar energy collectors and thermal energy storage; (8) reactor chemistry - the release of fission gas from irradiated fuel, the physical properties of various reactor materials for use in safety studies, and sodium purification and waste disposal; (9) fuel cycle technology - management of nuclear wastes, reprocessing of nuclear fuels, and proof-of-breeding for the Light Water Breeder Reactor at Shippingport, PA; and (10) magnetic fusion technology, mainly the breeder blanket, and neutron dosimetry and damage analysis. The CEN program in basic energy sciences included experimental and theoretical research on: (1) the catalytic hydrogenation of carbon monoxide and methanol homologation; (2) the thermodynamic properties of a wide variety of inorganic and organic materials; (3) significant mechanisms for the formation of atmospheric sulfate and nitrogen-bearing aerosols; (4) processes occurring at electrodes and in electrolytes; and (5) the physical properties of vapor systems. In addition, the Division continued to operate the Central Analytical Chemistry Laboratory.

3866 **(CONF-821031—2) Avoiding some common mistakes in writing proposals.** Jewell, W.T. (Oak Ridge National Lab., TN (USA)). 1982. Contract W-7405-ENG-26. 4p. NTIS, PC A02/MF A01. Order Number DE83001965.

From IEEE Professional Communication Society conference; Lynnfield-Wakefield, MA, USA (13 Oct 1982).

This paper presents guidelines that will help you avoid the most common mistakes that I, as a reviewer, see in technical proposals. The guidelines are: (1) follow the instructions given in the request for proposals regarding contents and format; (2) be sure to discuss every part of the work to be done; (3) do not include any irrelevant material; (4) edit your proposal carefully; and (5) show your understanding of the project.

3867 **(DOE/ES—0003) History of the Atomic Energy Commission.** Buck, A.L. (USDOE Assistant Secretary for Management and Administration, Washington, DC. Office of the Executive Secretary). Aug 1982. 29p. NTIS, PC A03/MF A01. Order Number DE83000892.

This pamphlet traces the history of the Atomic Energy Commission's twenty-eight year stewardship of the Nation's nuclear energy program, from the signing of the Atomic Energy Act on August 1, 1946, to the signing of the Energy Reorganization Act on October 11, 1974. The Commission's early concentration on the military atom produced sophisticated nuclear weapons for the Nation's defense and made possible the creation of a fleet of nuclear submarines and surface ships. Extensive research in the nuclear sciences resulted in the widespread application of nuclear technology for scientific, medical and industrial purposes, while the passage of the Atomic Energy Act of 1954 made possible the development of a nuclear industry, and enabled the United States to share the new technology with other nations.

3868 **(GKSS—82/E/1) GKSS scientific-technical reports 1981.** (GKSS-Forschungszentrum Geesthacht G.m.b.H., Geesthacht-Tesperhude (Germany, F.R.)). 1982. 54p. (In German). NTIS (US Sales Only), PC A04/MF A01. Order Number DE82750655.

The survey contains the authors' names and the titles of all external GKSS-reports (E-Reports) published in 1981. Thereafter abstracts and/or bibliographic data of those reports are presented - unless special prints of journal articles are concerned.

3869 (INIS-mf—7132, pp vp) **Twenty five years of the Nuclear Research Institute and its share of the developmental tasks of Czechoslovak nuclear power.** Podest, M. 1980. (In Czech). NTIS (US Sales Only), PC A09/MF A01.

From Nuclear Research Institute scientific and technical conference; Prague, Czechoslovakia (5 Jun 1980).

The most important results are outlined obtained by UJV in the past 25 years and their applications in Czechoslovak nuclear power are described. They include research work for the first Czechoslovak nuclear power plant A-1, light water reactors of the WWER type, fast reactors, research and experimental reactors, ceramic nuclear fuels, spent fuel processing and radioactive waste processing, the applications of ionizing radiations, and safety of nuclear power installations. (B.S.).

3870 (SAND—82-1354) Accommodation project for physically restricted personnel, Phase 1. Addendum: job-based criteria for nonskilled heavy laborers. Young, L.L. III; Mossman, P.B. (Sandia Labs., Albuquerque, NM (USA)). Aug 1982. Contract AC04-76DP00789. 21p. NTIS, PC A02/MF A01. Order Number DE83000999.

A study was conducted to determine possible accommodations for physically or medically restricted persons in the unskilled heavy labor group at Sandia National Laboratories. We conclude that only a very limited number of physically restricted persons might be accommodated under special conditions.

3871 (UCRL—88112) Electronic component documentation in a research-laboratory environment. Spencer, J.W. (Lawrence Livermore National Lab., CA (USA)). Aug 1982. Contract W-7405-ENG-48. 4p. (CONF-821031—1). NTIS, PC A02/MF A01. Order Number DE82021349.

From IEEE Professional Communication Society conference; Lynnfield-Wakefield, MA, USA (13 Oct 1982).

Documenting electronic components and assemblies used by design personnel at a scientific research laboratory is a challenge. Documentation must be both up-to-date and complete enough to provide designers the information they need for unusual applications. Yet, because of the relatively small quantities of components used, the documentation must be inexpensive to produce and distribute. Close interaction between technically-knowledgeable editor/writers and components engineers results in components documentation closely tailored to the needs of our design personnel. This paper discusses the philosophy underlying our efforts, as well as the organization, production, and distribution of our component documentation.

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REFER ALSO TO CITATION(S) 3517

3872 (AD-A—117830/0) Defense energy information system (DEIS): DEIS-80 design system specification. Revision B. Lengel, J. (Logistics Management Inst., Washington, DC (USA)). Jul 1982. 212p. NTIS, PC A10/MF A01.

The Defense Energy Information System (DEIS) is a worldwide, automated, energy management information system. It provides data on petroleum products used as mobility fuels by the military departments as well as most energy sources used for utility services at DoD installations. DEIS consists of two related information systems. DEIS I reports the disposition and consumption of petroleum products, notably aviation gasoline, jet fuels, motor gasoline, distillate and residual oils within DoD. DEIS II reports the consumption of utility energy, such as electricity, natural gas, purchased steam/hot water, fuel oil and coal. It reports the consumption and generation of energy from renewable sources. This document presents the System Specification for the enhanced DEIS (DEIS-80). As specified, DEIS-80 improves the utility of the existing system by including additional data, supporting management queries of the DEIS-80 data bases on-line, and providing the capability for automated data analysis.

3873 (EGG—1183-6003) Input file formatter for minicomputers. Hoy, M.J. (EG and G, Inc., Albuquerque, NM (USA)). 1982. Contract AC08-76NV01183. 9p. (CONF-821201—1). NTIS, PC A02/MF A01. Order Number DE82017069.

From Fall DECUS US Symposium; Anaheim, CA, USA (6 Dec 1982).

Portions of document are illegible.

This program is designed to aid computer users in the generation of input data files. These input data files are assumed to be input to another program of a specific nature. FMAT interprets a simple four word language and builds input data files as directed by this language. It also allows a format for user defined prompts. In this way, a user can build his own prompts and construct the data input file to meet the needs of a specific program. FMAT is based on the use of symbolic variables. A symbolic variable is a variable that holds a place in a line or character string. As the string is processed and a symbolic variable is found, the desired value is substituted for the symbolic variable. In this way, the values that are returned from a prompt are the values that actually go into the data file.

3874 (EGG-M—07582) Maximum of a quasi-smooth function. Wilkins, J.E. Jr.; Hatcher, T.R. (EG and G Idaho, Inc., Idaho Falls (USA)). 1982. Contract AC07-76ID01570. 28p. (CONF-820890—2). NTIS, PC A03/MF A01. Order Number DE83000561.

From 54. National Technical Association annual convention; Baltimore, MD, USA (2 Aug 1982).

Zygmund introduced the class of real valued functions f(x), defined and continuous on the closed interval I = [-1,1], such that (f(ξ) - 2f[ξ + eta)/2] + f (eta)) ≦ M (ξ - eta) for some constant M and all ξ and eta in I. Timan called such functions quasi-smooth. Let Z be the class of quasi-smooth functions for which M = 1 and f(-1) = f(+1) = 0. Suppose that K = sup max parallel f(x) parallel. Timan proved that K ≦ 4/3 and asserted that this was not the best result. Brudnyi attributed to Abramov the claim that K ≦ 383/288. He exhibited a function in Z whose maximum value is 5/4; hence K ≧ 5/4. Sokolova proved that K ≦ 4/3 - 4/381 = 168/127 < 1.322835, and conjectured that K = 5/4. In this paper we prove that 1.3 = 13/10 ≦ K ≦ 1014/779 < 1.301669, thus disproving Sokolova's conjecture. (In no way discouraged by her failure, we conjecture that K = 13/10.)

3875 (JINR—P5-82-239) Wahlquist-Estabrook method for the investigation of nonlinear evolution equations: one-dimensional case. Shvachka, A.B.; Yanovskii, Ya.B. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Computing Techniques and Automation). 1982. 17p. (In Russian). Joint Institute for Nuclear Research, Dubna, USSR.

The Wahlquist-Estabrook method which yields the inverse scattering method equations is considered. A short review is presented on the interpretation of the prolongation forms as connection forms and also on a possible extension of the method for the case of two spatial dimensions. For the description of the generalized Ablowitz-Kaup-Newell-Segur system a connection with structural group GL(n + 1, R) is proposed.

3876 (JINR—P5-82-242) Wahlquist-Estabrook method for the investigation of nonlinear evolution equations: two-dimensional case. Shvachka, A.B.; Yanovskii, A.B. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Computing Techniques and Automation). 1982. 9p. (In Russian). Joint Institute for Nuclear Research, Dubna, USSR.

The Wahlquist-Estabrook method which yields the linear inverse scattering equations for a given system of the nonlinear evolution equations is considered. A short review is presented on the interpretation of prolongation forms as connection forms and also on a possible extension of the method for the case of two spatial dimensions. Special case when only the first derivative on the second space variable enters in evolution equations is discussed.

3877 (JINR—P5-82-346) Monotonic schemes of high-order approximation for stiff differential equations. Shirkov, P.D. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Computing Techniques and Automation). 1982. 14p. (In Russian). Joint Inst. for Nuclear Research, Dubna, USSR.

The family of two-step schemes was investigated in detail for numerical solving of the Cauchy problem for stiff differential equations. There were received triparametric classes of third order schemes with complex coefficients which are conservative and monotonic for linear problems. Several monotonic and conservative schemes of fourth order were listed. Such schemes can be recommended for electrical circuit calculations.

3878 (JINR—P5-82-381) Existence of solution having given number of nodes of nonlinear differential equation psi⁴-B psi⁶ of theory. Amirkhanov, I.V.; Zhidov, E.P. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Computing Techniques and Automation). 1982. 10p. (In Russian). Joint Institute for Nuclear Research, Dubna, USSR.

The investigation of nonlinear equation $d^3/dx^3\ psi(x) - (l(l + 1)/x^2 + 1)psi(x) = - psi(x)\ [4\ psi^2(x)/x^2 - 3\ eta^2\ psi^4(x)/x^4]$, 0 <

eta^2 < 1), for boundary conditions psi(0) = psi(∞) = 0 is performed. The equation for zero value of 1 parameter was investigated by many authors before. Arbitrary integer value of 1 is considered. By means of variational approach the existence of solutions phi(x) = phi/sub n/(x) (n = 0, 1, 2, ...) of the boundary value problem which has exactly n modes at the interval 0 ≦ x < ∞ has been proved.

3879 **(JINR—P11-82-205) Problem-oriented versions of REDUCE-2 system of analytical calculations for theoretical-mechanics problems.** Lumpov, V.I.; Fedorova, R.N. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Computing Techniques and Automation). 1982. 10p. (In Russian). Joint Institute for Nuclear Research, Dubna, USSR.

Methods and software developed for problem-oriented versions of the REDUCE-2 system of analytical calculations for the ES computer are described. The REDUCE-2 version occupies the minor volume of core memory, is more effective and could be applied to investigate complicated mechanical problems on the ES computer with 512 K byte memory. As an example, the problem of probability investigation of nonlinear dynamic systems on the basis of its reducing to solution of the Fokker-Planck-Kolmogorov problem is considered.

3880 **(JINR—P11-82-290) Organization of work with permanent files in TERM conversational system of ES computer.** Koren'kov, V.V. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Computing Techniques and Automation). 1982. 6p. (In Russian). Joint Institute for Nuclear Research, Dubna, USSR.

TERM conversational system helps users in access to computer and software by means of terminals. One of the purposes of this work is to provide comfortable means for permanent file manipulations. The problems of control statement generation, command formats and particularities of these commands realization algorithm are considered. As a result of this system realization the user has a possibility to work with various text libraries during one session.

3881 **(JINR—P11-82-291) Organization of interchange with ES-7906 terminals in TERM conversational system of ES computer.** Koren'kov, V.V. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Computing Techniques and Automation). 1982. 10p. (In Russian). Joint Institute for Nuclear Research, Dubna, USSR.

TERM conversational system helps users in access to computer and software by means of terminals. The organization of interchange with the terminals defines the TERM system software structure. The particular features of graphic access method, the way of treatment of asynchronous signals for terminals are described. The common scheme of TERM conversational system processing allows one to put into one section all immediate work with terminals, which provides various ways of its switching.

3882 **(JINR—P11-82-298) Refinement of approximated solution of nonlinear differential equation of second order.** Zhidkov, E.P.; Sidorova, O.V. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Computing Techniques and Automation). 1982. 22p. (In Russian). Joint Institute for Nuclear Research, Dubna, USSR.

The boundary problem for nonlinear differential equation of the second order is considered. The problem is assumed to have a unique solution, stable over the right part. It was proved that if the step of the net is small, then the corresponding difference value problem has a unique solution, stable over the right part. Expansion over degrees of discrediting step for approximate solutions is established. The expansion allows one to apply the Richardson type extrapolation. Efficiency of extrapolation is illustrated by numerical example.

3883 **(Juel-Spez—116) CAMAC driver in the VAX-11/780 and VAX-11/780 and VMS 2.1 operation system for the PDP 11 Camac Crate Controller Borer and the DMA interface KFA-ZEL NE 300 and display interface KFA Zel NE 414.** Heer, H.; Stoff, H. (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Zentrallabor fuer Elektronik). Jun 1981. 65p. (In German). NTIS (US Sales Only), PC A04/MF A01. Order Number DE82903745.

A description is given of an experimental hardware module for the CAMAC computer system and the integration of a driver in the VAX operations systems. A software interface is developed which can be used for implementing other applications with similar data processing requirements. Diagrams are given for circuitry, coding sequences, test routine, and hardware display. 7 figures.

3884 **(Juel-Spez—125) Parallel algorithms.** Hossfeld, F. (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Zentralinstitut fuer Angewandte Mathematik). Aug 1981. 175p. (In German). NTIS (US Sales Only), PC A08/MF A01. Order Number DE82904402.

A literature survey is made of studies undertaken on the principles, analysis, and evaluation of algorithms with respect to computer design and programming. Topics include elements of parallel algorithms, algorithms of linear algebra, and rapid Fourier transformations. Tables are presented on Euclid algorithm examples, effects of increasing computer speed, and paralleling arithmetical expressions. 54 references, 25 figures, 3 tables.

3885 **(LA—9448-MS) FORSIG: an extension of FORTRAN with significance arithmetic.** Hyman, J.M. (Los Alamos National Lab., NM (USA)). Sep 1982. Contract W-7405-ENG-36. 103p. NTIS, PC A06/MF A01. Order Number DE83001955.

We describe a new arithmetic, called significance arithmetic, and a FORTRAN-like language, called FORSIG, that account for the creation and propagation of errors in a computer program due to uncertainties in the data. To compute reasonable and accurate bounds on these errors, the dependencies developing between the variables during execution are monitored automatically and used by the significance arithmetic algorithms. These dependencies are also a measure of the sensitivity of the solution as a function of the error in the data.

3886 **(LA-UR—82-1572) Configurating a supercomputer for an interactive scientific workload.** Anderson, W.; Brice, R.; Alexander, W. (Los Alamos National Lab., NM (USA)). 1982. Contract W-7405-ENG-36. 10p. (CONF-821202—1). NTIS, PC A02/MF A01. Order Number DE82018367.

From 13. Computer Measurement Group conference; San Diego, CA, USA (14 Dec 1982).

A detailed, validated simulation model of an existing Cray-1 running under an interactive operating system was used to investigate configurations of a new supercomputer recently announced by the same vendor. The goal was to determine the optimum configuration for a known interactive scientific workload. Questions considered included how much main memory would be needed and whether to acquire an optional fast swapping device.

3887 **(LA-UR—82-1819) Performance modeling in the design process.** Alexander, W.; Brice, R. (Los Alamos National Lab., NM (USA)). 1982. Contract W-7405-ENG-36. 11p. (CONF-821202—2). NTIS, PC A02/MF A01. Order Number DE82017328.

From 13. Computer Measurement Group conference; San Diego, CA, USA (14 Dec 1982).

Portions of document are illegible.

Here, in capsule form, are some lessons learned trying to integrate performance modeling into the design process. Performance modeling should play a central role in system design; ignore it at your peril. The role of performance modeling is not the same in all design projects. Clearly specify performance goals and what factors will affect performance; they try to model those factors. Obtaining the data for the models can be a major problem; ongoing measurement projects are always worthwhile. Prototypes can be valuable data gathering tools if they are instrumented for this purpose. An-

ticipate the effect of environment on the system you are designing, and the effects of the system on the environment. Including the performance analyst on the design team from the beginning; if he is perceived as an outsider, he is more likely to be ignored, especially if decisions have already been made.

3888 **(LA-UR—82-2655) Dual spaces of differential Lie algebras.** Kupershmidt, B.A. (Los Alamos National Lab., NM (USA)). 1982. Contract W-7405-ENG-36. 10p. (CONF-8205121—5). D. Order Number DE83000650.

From CNLS order in Chaos conference; Los Alamos, NM, USA (24 May 1982).

Portions of document are illegible.

We present a mathematical scheme which serves as an infinite-dimensional generalization of Poisson structures on dual spaces of finite-dimensional Lie algebras, which are well known and widely used in classical mechanics. These structures have recently appeared in the theory of Lax equations, long waves in hydrodynamics, and various other physical models: compressible hydrodynamics, magnetohydrodynamics, multifluid plasmas, elasticity, superfluid ^{4}He and ^{3}He-A, Ginzburg-Landau theory of superconductors, and classical chromohydrodynamics (the generalization of plasma physics to Yang-Mills interactions).

3889 **(LBL—14127) Optimal choice of directions for the reconstruction of an object from a finite number of its plane integrals.** Tam, A.M. (Lawrence Berkeley Lab., CA (USA)). May 1982. Contract AC03-76SF00098. 98p. NTIS, PC A05/MF A01. Order Number DE83000497.

Thesis.

The density of hydrogen nuclei in an object is a function f (x,y,z) with compact support whose plane integrals can be approximated by nuclear magnetic resonance (NMR) measurements. We show how a large number of basis polynomials are automatically integrated by formulas which are invariant with respect to the group of rotations associated with one of the regular solids (tetrahedron, octahedron-cube, dodecahedron-icosahedron). In an effort to simplify the procedure for finding icosahedral formulas, we eliminated one of the three degrees of freedom associated with a node by assigning the same weight to each node. The resulting system of non-linear equations can be solved by numerical methods, but good initial guesses, as well as some preliminary manipulations, are still needed. Gruenbaum proposed the heuristic principle that, for large N, a good set of nodes anti u_1,..., anti u/sub N/ could be found by minimizing the potential energy due to N pairs of electrons positioned at +- anti u/sub i/ Numerically minimizing this function of 2N variables is practically impossible for $N > 200$, however. We reduced the number of variables by a factor of 60 by requiring that the set of points consist of several icosahedral orbits. This method of finding quadrature nodes is almost automatic, requiring no special adjustments beyond a good initial guess. We compare the different quadrature formulas by reconstructing a three-dimensional model of a human head. The uniform-weight and equilibrium distributions perform as well as product-space methods which use twice as many directions.

3890 **(ORNL/TM—8507) TSX-Plus for laboratory data acquisition and control.** Keller, J.M. (Oak Ridge National Lab., TN (USA)). Oct 1982. Contract W-7405-ENG-26. 41p. NTIS, PC A03/MF A01. Order Number DE83001633.

TSX-Plus is a multi-user operating system for PDP-11 and LSI-11 computers, which offers many of the features available with the DEC RSX-11M. For present users of RT-11 who wish to upgrade to a multi-user operating system, TSX-Plus offers several advantages over RSX-11M, such as lower cost and software compatibility with RT-11. TSX-Plus maintains a similarity with RT-11 by employing the RT-11 utility programs and device drivers; also, the RT-11 monitor commands are a subset of the TSX-Plus commands. Laboratory applications of TSX-Plus are discussed, and a set of FORTRAN callable subroutines, which are useful for data acquisition and hardware control, are presented. Also, the use of hardware interrupt and trap instructions (software interrupt) under TSX-Plus are discussed.

3891 **(SAND—82-0853) Simulation study of the central computing network.** Jones, L.C. (Sandia National Labs., Albuquerque, NM (USA)). Oct 1982. Contract AC04-76DP00789. 38p. NTIS, PC A03/MF A01. Order Number DE83001713.

A local computer network is under development at Sandia National Laboratories to upgrade the performance of existing computer systems and to provide new capabilities for users. Network objectives include easy expansion for future needs and reliable security measures. A discrete event simulation, developed from simulation work done at Lawrence Livermore National Laboratories, was used to investigate unresolved questions concerning the topology and protocols for the network.

3892 **(SAND—82-0984) Interactive QMESH on VAX at Sandia National Laboratories, Albuquerque.** Mayes, R.L. (Sandia National Labs., Albuquerque, NM (USA)). Aug 1982. Contract AC04-76DP00789. 68p. NTIS, PC A04/MF A01. Order Number DE83000526.

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The two-dimensional mesh generating program, QMESH, has been adapted to an interactive application, whereby a user may process finite element meshes at a computer graphics terminal communicating with a VAX computer. Additions and corrections may be made at the terminal. Several mesh variation schemes may be tried in the evolution of a desired finite element mesh. Included in the package are the bandwidth minimization programs, RENUM and RENUM8, with which a user may interactively optimize the mesh numbering.

3893 **(SAND—82-1976) STATLIB.** Anderson, H.E. (Sandia National Labs., Albuquerque, NM (USA)). Sep 1982. Contract AC04-76DP00789. 65p. NTIS, PC A04/MF A01. Order Number DE83002138.

A conversational statistical program library is available for the VAX time-sharing computers which should have general applicability in many areas of the laboratory. The library evolved during the development of the in-hours course, Statistical Design and Analysis, sponsored by the Sandia Laboratories Education Committee. This was an applied statistics course primarily intended for practicing engineers and scientists. Several existing programs were modified for use in the time-sharing mode, and others were designed specifically for the course. Experience has shown, however, that the routines have practical worth beyond the confines of the course. They were designed with the casual computer user in mind so computer comments are terse but explicit, and the user has considerable flexibility in the use of the routines themselves. The library presently comprises some 58 subroutines, of which 15 are conversational and argument-free. The latter are considered the library proper, and are discussed in detail in this document. More knowledgeable programmers could also make use of some of the other support routines if desired. An abbreviated list of these is included as Appendix A. Further information on these may be obtained from the author. Other subroutines may be added to the library as they are deemed suitable for inclusion.

3894 **(SAND—82-8009) Text II: a guide to automated preparation of visual aids.** Barker, B.E. (Sandia National Labs., Livermore, CA (USA)). Sep 1982. Contract AC04-76DP00789. 90p. NTIS, PC A05/MF A01. Order Number DE83000966.

This manual describes the use of a computer program TEXT to generate high quality textual slides and view-graphs. The program may be directed to generate the plotted output on 35 mm microfilm or other plotting device or the user may interact with the program to place blocks of text and draw lines. TEXT is based on the latest version of the DISSPLA plotting system and incorporates all DISSPLA fonts and in-line instruction capabilities.

3895 **(UCRL—87478) Opportunities for utilizing computer-based telecommunication tools in continuing education.** Miller, E.K.; Decker, W.D. (Lawrence Livermore National Lab., CA (USA)). 1982. Contract W-7405-ENG-48. 7p. (CONF-820522—2). D. Order Number DE83000738.

From Electro '82 conference; Boston, MA, USA (25 May 1982).

Portions of document are illegible.

This paper describes some near-term and longer-term possibilities for utilizing computer-based telecommunications technology in education that are not limited just to continuing education. As will be seen, our view is that computers are bound to play an increasingly important role is this area and must be taken into account even if the specific concern is, as we began with, telecommunications utilization. This theme will be developed after first describing briefly our experience of many years at Livermore in using television to enhance our educational offerings, the use of which has only scratched the surface so far.

9903 Information Handling

REFER ALSO TO CITATION(S) 2529, 2530

3896 **Energy and economic data bank for nuclear programme.** Patek, O.; Hajicek, J. (Ceskoslovenska Komise pro Atomovou Energii, Zbraslav nad Vltavou. Ustredni Informacni Stredisko pro Jaderny Program). pp vp of Factual information. Conference proceedings. Plzen, Czechoslovakia; Ceskoslovenska Vedeckotechnicka Spolecnost ([nd]). (In Czech)

From Conference on factual information; Marianske Lazne, Czechoslovakia (28 Apr 1982).

The Energy and Economic Databank (EEDB) has been built by the IAEA since 1976. The databank contains data on nuclear power and conventional power generation in all countries in the world. Czechoslovakia has experimentally been utilizing it since 1980. The EEDB uses an IBM 370 computer and the ADABAS software. Outputs are obtained using routines written in the NATURAL query language. The experience gained with the EEDB utilization is briefly characterized. (author).

3897 **(BMFT-FB-T—82-024) VLSI-circuits for teletext (Videotext) and viewdata (Bildschirmtext).** Vignau, R. von. (Bundesministerium fuer Forschung und Technologie, Bonn (Germany, F.R.)). 1982. 70p. (In German). NTIS (US Sales Only), PC A04/MF A01. Order Number DE82750540.

In the course of this project the application of existing teletext decoders was to be carried out, to make the availability of teletext and viewdata for German television setmakers practicable. Investigations to standardize the system were to be supported, evaluated and prepared for further examinations. One main job of the project was to work out the possibilities of very large scale integration (VLSI) for the teletext decoder circuit.

3898 **(DOE/ER/05075—14) Study of preservation of documents at Department of Energy laboratories. Final report.** Warnow, J.N.; Needell, A.; Weart, S.R.; Wolff, J. (American Inst. of Physics, New York). Jan 1982. Contract AC02-78ER05075. 77p. (COO—5075-14). NTIS, PC A05/MF A01. Order Number DE83001210.

The study by the American Institute of Physics (AIP) of records management and appraisal at Department of Energy (DOE) laboratories is the most extensive such study thus far. Some eight-man years were spent, primarily on site at Argonne, Brookhaven, Lawrence Berkeley, and Oak Ridge National Laboratories. These studies were supplemented by a questionnaire survey of some 40 DOE installations and a study of other federal scientific agencies. The project was guided throughout by a blue ribbon advisory committee of scholars, archivists, and records managers, who co-authored the project's set of recommendations to DOE. Major support for the study was provided by the DOE Office for Energy Research and the four laboratories that were the focus of the study. This final report on the AIP project consists of two sections: the main report with summary information and with detailed recommendations to DOE, and an Appendix with detailed information on the elements of the project and its findings.

3899 **(DOE/TIC—4585-Rev.3) Energy Data Base: corporate author entries.** Hendricks, P.L. (ed.). (Department of Energy, Oak Ridge, TN (USA). Technical Information Center). Aug 1982. 776p. NTIS. Order Number DE82016597.

Corporate author entries provide a means for consistent citing of the names of organizations in bibliographic records in the data bases of the DOE Technical Information Center. These entries serve as guides for users of the DOE/RECON computerized data bases who want to locate information originating in particular organizations. (GHT)

3900 (INIS-mf—7042, pp 135) **Data retrieval for the Czechoslovak nuclear programme.** Hajicek, J. (Ceskoslovenska Komise pro Atomovou Energii, Zbraslav nad Vltavou. Ustredni Informacni Stredisko pro Jaderny Program). 1980. (In Russian). NTIS (US Sales Only), PC A07/MF A01.

From Conference on topics in information on nuclear science and technology; Prague, Czechoslovakia (26 Jul 1979).

The problems are discussed of factographic information systems for nuclear science and technology, their importance, construction and use. A survey is given of these systems operating within Czechoslovakia, CMEA, within the framework of the IAEA and in the capitalist countries. (M.S.).

3901 (INIS-mf—7042, pp 135) **Application of the USS software system to data retrieval, exemplified on a nuclear power plant data file.** Wellhausen, U. (Akademie der Wissenschaften der DDR, Leipzig. Inst. fuer Angewandte Radioaktivitaet). 1980. (In Russian). NTIS (US Sales Only), PC A07/MF A01.

From Conference on topics in information on nuclear science and technology; Prague, Czechoslovakia (26 Jul 1979).

A data file was established containing the most important parameters on nuclear power plants with PWR's. Several examples are given of data retrieval from the files using computer programmes. (M.S.).

3902 (INIS-mf—7042, pp vp) **Applying software system USS to processing of international nuclear data files.** Letz, B. (Akademie der Wissenschaften der DDR, Leipzig. Zentralinstitut fuer Isotopen- und Strahlenforschung). 1980. (In Russian). NTIS (US Sales Only), PC A07/MF A01.

From Conference on topics in information on nuclear science and technology; Prague, Czechoslovakia (26 Jul 1979).

The system is described of automatic data retrieval from information files which are available at the information and computer centre of the Academy of Sciences of the GDR. The technical implementation is described of data retrieval and of the use of computer programmes. (M.S.).

3903 (INIS-mf—7042, pp vp) **Building and utilizing a bank of data on environmental radioactivity.** Kumicak, J. (Ustav Radioekologie a Vyuzitia Jadrovej Techniky, Kosice (Czechoslovakia)). 1980. (In Russian). NTIS (US Sales Only), PC A07/MF A01.

From Conference on topics in information on nuclear science and technology; Prague, Czechoslovakia (26 Jul 1979).

Vast quantities of data are related to radioactive environmental contamination. This requires the sorting and processing of such data by computer. The concept is indicated of a system of data collection, accumulation and processing. The method is described of storing such data in the computer memory, and the types of outputs from the computer are discussed. (M.S.).

3904 (INIS-mf—7042, pp vp) **Principles of constructing a data retrieval system for investigating the trends of nuclear research.** Jankowski, L. (Akademie der Wissenschaften der DDR, Leipzig. Zentralinstitut fuer Isotopen- und Strahlenforschung). 1980. (In Russian). NTIS (US Sales Only), PC A07/MF A01.

From Conference on topics in information on nuclear science and technology; Prague, Czechoslovakia (26 Jul 1979).

The significance and function is discussed of the retrieval language for work with data in a certain problem area. The individual demands are listed which are placed on the structure of the retrieval language with regard to the individual needs of the users. The language must express unambiguously objective facts and their inter-relations, it must be formed such as to make its individual elements allow the synthesis of new information. (M.S.).

3905 (INIS-mf—7042, pp vp) **Use of a data retrieval system in servicing specialists from the fields of nuclear science and technology.** Reshet'ko, Yu.V.; Maksimov, V.N. (Tsentral'nyj Nauchno-Issledovatel'skij Inst. Informatsii i Tekhniko-Ehkonomicheskikh Issledovanij po Atomnoj Nauke i Tekhnike, Moscow (USSR)). 1980. (In Russian). NTIS (US Sales Only), PC A07/MF A01.

From Conference on topics in information on nuclear science and technology; Prague, Czechoslovakia (26 Jul 1979).

The method is described of the bibliographic description of documents, the structure of data files stored on magnetic tape, retrieval and print-out. The prospects are evaluated of the described system of information and demands placed on its future development. (M.S.).

9904 Law

3906 **(INIS-mf—7157) Education (Schools and Further Education) Regulations 1981 (23 July 1981).** 1 Sep 1981. 8p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83780018.

These Regulations concern the use of radioactive substances and apparatus in schools and further education establishments. The approval of the Secretary of State for Education and Science is required for the use of such substances and apparatus, and his approval may be withdrawn if arrangements for health and safety of pupils and staff are inadequate. The Regulations revoke the Schools Regulations, 1959 (as amended), and the Further Education Regulations, 1975. (NEA).

3907 **(INIS-mf—7308) Summary of the law relating to atomic energy and radioactive substances.** Sim, D.F.; Ritchie, K.J.S. (UKAEA Headquarters, London). Apr 1982. 20p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83780076.

The law relating to atomic energy and radioactive substances in the United Kingdom is summarized under the following headings: the Common Law; legislation (Atomic Energy Act 1946; Radioactive Substances Acts 1948 and 1960; Electricity (Amendment) Act 1961; Nuclear Installations Act 1965 and 1969 (and subordinate legislation); Secretary of State for Trade and Industry Order 1970; Radiological Protection Act 1970 (as amended); Air Navigation (Restriction of Flying)(Atomic Energy Establishments) Regulations 1981; Nuclear Safeguards and Electricity (Finance) Act 1978; legislation relating to the UK Atomic Energy Authority); Regulations under the Factories Act 1961; Regulations relating to educational establishments; Regulations and Orders relating to food and medicines; Regulations, etc., affecting the transport of radioactive materials; Regulations under the Social Security Act 1975; control of import and export; the Euratom Treaty; important non-statutory Codes of Practice, etc.; international conventions, etc., relating to the peaceful use of atomic energy and radioactive substances, in which the United Kingdom is interested; foreign legislation. (U.K.).

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In the Corporate Index, report literature is indexed using the name of the organization or institution responsible for issuing the report. Headings are provided for all report literature and for published literature for which a corporate approach is especially desirable, e.g., symposium and conference proceedings.

Each entry under a corporate heading gives the document title and the volume and abstract numbers. The document type, e.g., R for Report; country of publication, e.g., US; and language of the document, e.g., In German; are given in parentheses at the end of the entry. If no language statement appears, the language is English. Tables of document types and country of publication codes appear after the indexes.

DOE Energy Information Data Base: Corporate Author Entries (DOE/TIC-4585) is used in the standardization of corporate entries. DOE/TIC-4585 is available for purchase from the National Technical Information Service (NTIS), U. S. Department of Commerce, Springfield, Virginia 22161.

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The title may be supplemented with additional words, or a phrase, if it appears additional information would be helpful. In cases for which the title contains little or no information related to the subject entry, it may be replaced entirely by the supplementary information. A qualifier is not always required, and in such cases the title will follow the unqualified subject descriptor.

The descriptors selected for use as subject terms are generally the names of specific materials, things, or processes. To the extent possible, a qualifier is selected to describe the properties of, or processses applied to, the subject term.

Index entries are selected to indicate the important ideas and concepts presented in a document, rather than words that may appear in the text. Within the available thesaurus terms, the most probable or logical place to look for typical information is selected. "See references" are included to guide users from synonymous terms or phrases to the descriptor selected as a subject heading for the concept (e.g. Pipeline Quality Gas see HIGH BTU GAS). "See also references" are used to indicate where to find references to subject concepts that are narrower, broader, or related to a particular subject heading. To complete an exhaustive search of a given subject, all such headings should be reviewed. Copies of DOE/TIC-7000, the Subject Thesaurus, are available from the National Technical Information Service (NTIS), U. S. Department of Commerce, Springfield, VA 22161.

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	8:1522	DOE/ET/10159—T13
	8:1523	DOE/ET/10159—T14
	8:1524	DOE/ET/10159—T16
	8:1570	DOE/ET/10159—T23
	8:1583	DOE/ET/10159—T21
AC01-78PE02835	**ICF, Inc., Washington, DC (USA)**	
	8:2370	DOE/PE/02835—T1
AC01-79CS30027	**Automation Industries, Inc., Silver Spring, MD (USA). Vitro Labs. Div.**	
	8:1879	SOLAR/0010—82/09
AC01-79ET14287	**Auburn Univ., AL (USA)**	
	8:1620	DOE/ET/14287—T1
AC01-79ET14693	**North Carolina Univ., Chapel Hill (USA). Dept. of Geology**	
	8:1597	DOE/ET/14693—T9
AC01-79ET29009	**Meisel Energy Systems, Inc., Birmingham, MI (USA)**	
	8:2083	DOE/ET/29009—1
AC01-80EI10295	**Management Engineers, Inc., Reston, VA (USA)**	
	8:1602	DOE/EIA/10295—T1
AC01-80ET14746	**Carnegie-Mellon Inst. of Research, Pittsburgh, PA (USA)**	
	8:1584	DOE/ET/14746—4
AC01-80ET15234	**Boyce Engineering International, Inc., Houston, TX (USA)**	
	8:2057	DOE/ET/15234—T1
AC01-80ET15611	**Stanford Univ., CA (USA). High Temperature Gasdynamics Lab.**	
	8:2442	HTGL—231
AC01-80ET40110	**Mitre Corp., McLean, VA (USA). METREK Div.**	
	8:1721	DOE/ET/40110—1
AC01-81EV10447	**Institute of Gas Technology, Chicago, IL (USA)**	
	8:1672	DOE/EV/10447—T1
AC01-81NE32077	**United Engineers and Constructors, Inc., Philadelphia, PA (USA)**	
	8:2215	UEC-DOE—820930
AC02-76CH00016	**Brookhaven National Lab., Upton, NY (USA)**	
	8:1582	BNL—51305
	8:1720	BNL—31887
	8:1894	BNL—51560
	8:1993	BNL—51564
	8:2453	BNL—31828
	Rocket Research Co., Redmond, WA (USA)	
	8:2454	BNL—51540
	Hirschfeld (Herbert E.), Far Rockaway, NY (USA)	
	8:2455	BNL—51545
	Virginia Univ., Charlottesville (USA). School of Engineering and Applied Science	
	8:2456	BNL—51549
	Brookhaven National Lab., Upton, NY (USA)	
	8:2552	BNL—31863
	8:2781	BNL—31856
	8:2787	BNL—51538
	8:2797	BNL—31396
	8:2798	BNL—31848
	8:2799	BNL—31874
	8:2800	BNL—31947
	8:2801	BNL—31989
	8:2852	BNL—31394
	8:2861	BNL—31853
	8:2862	BNL—31854
	8:2949	BNL—31840
	8:3043	BNL—31849
	8:3044	BNL—31911
	8:3051	NAS-NS—3201
	8:3183	BNL—31916
	8:3187	BNL—31885
	8:3188	BNL—31957
	8:3189	BNL—31997
	8:3211	BNL—31782
	8:3212	BNL—31987
	8:3325	BNL-NCS—31877
AC02-76CH03000	**Fermi National Accelerator Lab., Batavia, IL (USA)**	
	8:2788	FERMILAB/TM—1132
	8:2804	FERMILAB/TM—1133
	8:2805	FERMILAB/TM—1136
	8:2867	FERMILAB/TM—1129
	8:3202	FERMILAB—81/81-EXP-R
AC02-76CH03073	**Princeton Univ., NJ (USA). Plasma Physics Lab.**	
	8:3734	PPPL—1928
	8:3735	PPPL—1944
	8:3736	PPPL—1950
	8:3831	PPPL—1922
	8:3832	PPPL—1937
	8:3833	PPPL—1942
AC02-76ER01198	**Illinois Univ., Urbana (USA). Dept. of Metallurgy and Mining Engineering**	
	8:1564	DOE/ER/01198—1392
	8:1959	Journal of the American Chemical Society 104 NO. 12. 3315-3320 (16 Jun 1982).
AC02-76ER01198	**Illinois Univ., Urbana (USA). Materials Research Lab.**	
	8:2638	DOE/ER/01198—1390
AC02-76ER01545	**Ohio State Univ., Columbus (USA)**	
	8:3198	DOE/ER/01545—T1-Pt.1
	8:3221	DOE/ER/01545—T1-Pt.2
AC02-76ER01713	**Washington Univ., St. Louis, MO (USA)**	
	8:2702	DOE/ER/01713—110
AC02-76ER02026	**Minnesota Univ., Minneapolis (USA). Dept. of Chemical Engineering and Materials Science**	
	8:2691	DOE/ER/02026—42

Contract No.	Abstract No.	Report No.
AC02-76ER02567	Nebraska Univ., Lincoln (USA). Dept. of Chemistry	
	8:3154	DOE/ER/02567—8
AC02-76ER02706	Northwestern Univ., Evanston, IL (USA). Dept. of Physics	
	8:3251	DOE/ER/02706—8
AC02-76ER02753	Kansas State Univ., Manhattan (USA). Dept. of Physics	
	8:3155	DOE/ER/02753—179
AC02-76ER03244	Carnegie-Mellon Univ., Pittsburgh, PA (USA)	
	8:3222	DOE/ER/03244—99
	Carnegie-Mellon Univ., Pittsburgh, PA (USA). Dept. of Physics	
	8:3229	DOE/ER/03244—100
AC02-76ER03420	Pennsylvania State Univ., University Park (USA). Dept. of Materials Science and Engineering	
	8:2620	DOE/ER/03420—9
AC02-76ER03435	Pittsburgh Univ., PA (USA). Dept. of Chemistry	
	8:2694	DOE/ER/03435—1
AC02-76ET20051	Cornell Univ., Ithaca, NY	
	8:1865	NRAES—13(1981).
AC02-76ET20279	Massachusetts Inst. of Tech., Lexington (USA). Lincoln Lab.	
	8:1898	DOE/ET/20279—227
	8:1899	DOE/ET/20279—228
	8:1900	DOE/ET/20279—229
	New Mexico State Univ., Las Cruces (USA). New Mexico Solar Energy Inst.	
	8:1973	DOE/ET/20279—200
	Massachusetts Inst. of Tech., Lexington (USA). Lincoln Lab.	
	8:1974	DOE/ET/20279—226
	8:2042	DOE/ET/20279—230
AC02-76ET20310	Carnegie-Mellon Univ., Pittsburgh, PA (USA)	
	8:1990	DOE/ET/20310—13
AC02-76ET34205	Dow Chemical Co., Midland, MI (USA). Dow Nuclear Services	
	8:2098	DOE/ET/34205—33
AC02-76ET53034	Iowa Univ., Iowa City (USA). Dept. of Physics and Astronomy	
	8:3552	DOE/ET/53034—64
AC02-76ET53041	Northwestern Univ., Evanston, IL (USA)	
	8:3553	DOE/ET/53041—14
AC02-76EV02040	Chicago Univ., IL (USA)	
	8:3039	DOE/EV/02040—T80
AC02-76EV12529	Columbia Univ., Palisades, NY (USA). Lamont-Doherty Geological Observatory	
	8:3026	DOE/EV/12529—21
AC02-77CH00178	Rensselaer Polytechnic Inst., Troy, NY (USA)	
	8:1841	SERI/STR—231-1722
	Solar Energy Research Inst., Golden, CO (USA)	
	8:1878	SERI/TP—254-1711
	Westinghouse Research and Development Center, Pittsburgh, PA (USA)	
	8:1946	SERI/PR—8143-1-T10
	Stanford Univ., CA (USA). Dept. of Materials Science and Engineering	
	8:1947	SERI/PR—9330-1-T7
	Solar Energy Research Inst., Golden, CO (USA)	
	8:1948	SERI/TP—211-1609
	8:1949	SERI/TP—211-1716
	8:1950	SERI/TP—211-1731
	8:1951	SERI/TP—211-1747
	8:1952	SERI/TP—211-1757
	8:1953	SERI/TP—212-1718
	8:1954	SERI/TP—212-1738
	8:1955	SERI/TP—212-1749
	Colorado Univ., Boulder (USA)	
	8:1956	SERI/TR—9053-1-T7

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	Solar Energy Research Inst., Golden, CO (USA)	
	8:1983	SERI/TP—254-1739
	8:1991	SERI/TP—252-1596
	JBF Scientific Corp., Wilmington, MA (USA)	
	8:2054	SERI/STR—211-1707
	Washington Univ. Technology Associates, Inc., St. Louis, MO (USA)	
	8:2055	SERI/TR—11052-2
	Eureka Labs., Inc., Sacramento, CA (USA)	
	8:2527	SERI/STR—231-1709
AC02-78ER04987	Northwestern Univ., Evanston, IL (USA). Dept. of Chemical Engineering	
	8:2680	DOE/ER/04987—3
AC02-78ER04991	Cornell Univ., Ithaca, NY (USA). Dept. of Chemistry	
	8:2681	DOE/ER/04991—4
AC02-78ER05075	American Inst. of Physics, New York	
	8:3898	DOE/ER/05075—14
AC02-78ET29185	Wisconsin Univ., Madison (USA)	
	8:2082	CONF-810903—3
	8:2087	DOE/ET/29185—21
AC02-78ET29232	Sargent and Lundy, Chicago, IL (USA)	
	8:2346	EPRI-EM—2351-Vol.3-Pt.2
AC02-78ET34212	Babcock and Wilcox Co., Lynchburg, VA (USA)	
	8:2110	DOE/ET/34212—33
AC02-78ET51013	Massachusetts Inst. of Tech., Cambridge (USA). Plasma Fusion Center	
	8:3551	DOE/ET/51013—58
AC02-79ER10382	General Electric Co., Schenectady, NY (USA). Corporate Research and Development Center	
	8:2560	DOE/ER/10382—3
AC02-79ER10402	Saint Bonaventure Univ., NY (USA)	
	8:3200	DOE/ER/10402—2
AC02-79ET10815	Tennessee Univ., Tullahoma (USA). Space Inst.	
	8:2440	DOE/ET/10815—76
AC02-79ET34015	UNC Nuclear Industries, Inc., Richland, WA (USA)	
	8:2108	DOE/ET/34015—1
AC02-79ET34020	Babcock and Wilcox Co., Lynchburg, VA (USA)	
	8:2109	DOE/ET/34020—3
AC02-79EV10305	Colorado State Univ., Fort Collins (USA). Dept. of Radiology and Radiation Biology	
	8:1788	DOE/EV/10305—7
AC02-80ER10661	Cornell Univ., Ithaca, NY (USA)	
	8:2687	DOE/ER/10661—T1
AC02-80ER10740	Oxford Univ. (UK). Dept. of Engineering Science	
	8:2561	DOE/ER/10740—4
AC02-80EV10403	Illinois Univ., Urbana (USA). Coll. of Liberal Arts and Sciences	
	8:2668	DOE/EV/10403—7
AC02-81CS90024	Thermo Electron Corp., Waltham, MA (USA)	
	8:2501	DOE/CS/90024—1
AC02-81ER10831	Massachusetts Inst. of Tech., Cambridge (USA). Dept. of Chemistry	
	8:3157	DOE/ER/10831—2
AC02-81ER40033	Rockefeller Univ., New York (USA)	
	8:3201	DOE/ER/40033—29
AC02-81EV10665	Columbia Univ., Palisades, NY (USA). Lamont-Doherty Geological Observatory	
	8:2951	DOE/EV/10665—2
AC02-82CE30742	ESG, Inc., Atlanta, GA (USA)	
	8:1999	DOE/CE/30742—1
	8:2000	DOE/CE/30742—2
AC02-82CH10122	ESG, Inc., Atlanta, GA (USA)	
	8:1887	DOE/CH/10122—4
	8:1888	DOE/CH/10122—5

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	8:2001	DOE/CH/10122—6
	8:2002	DOE/CH/10122—6
AC02-82ER53132	Ogden (Joan M.), Princeton, NJ (USA)	
	8:3548	DOE/ER/53132—1
AC02-82ER53136	Iowa Univ., Iowa City (USA). Dept. of Physics and Astronomy	
	8:3549	DOE/ER/53136—1
AC02-82ER53140	Grumman Aerospace Corp., Princeton, NJ (USA)	
	8:3550	DOE/ER/53140—3
AC02-82ER60033	Franklin McLean Memorial Research Inst., Chicago, IL (USA)	
	8:3045	DOE/ER/60033—3
AC03-76ER00850	Utah Univ., Salt Lake City (USA). Dept. of Physics	
	8:2864	CONF-820718—11
	Stanford Univ., CA (USA)	
	8:3193	CONF-7910125—8
AC03-76ET53057	Science Applications, Inc., Boulder, CO (USA). Plasma Research Inst.	
	8:3737	SAI—254-82-274-LJ
AC03-76SF00098	Lawrence Berkeley Lab., CA (USA)	
	8:1639	LBL—14118
	8:1877	LBL—14913
	8:1926	LBL—14223
	8:2307	LBL—14846
	8:2458	DOE/BP—140
	8:2459	DOE/BP—141
	8:2581	LBL—11519
	8:2582	LBL—13099
	8:2583	LBL—14750
	8:2584	LBL—14751
	8:2585	LBL—14845
	8:2653	LBL—14227
	8:2654	LBL—14580
	8:2683	LBL—14625
	8:2690	Journal of the American Chemical Society 104 NO. 12. 3533-3534 (16 Jun 1982).
AC03-76SF00098	Lawrence Berkeley Lab., CA (USA)	
	8:2796	LBL—14635
	8:2905	LBL—14114
	8:2921	LBL—14739
	8:3176	LBL—14857
	8:3258	LBL—13366
	8:3321	LBL—14864
	8:3502	LBL—14824
	8:3889	LBL—14127
AC03-76SF00515	Stanford Linear Accelerator Center, CA (USA)	
	8:3210	SLAC-PUB—2943
AC03-78SF01424	Conoco, Inc., Casper, WY (USA)	
	8:1636	DOE/SF/01424—45
AC03-79CS30208	Planco, Inc., Dallas, TX (USA)	
	8:2461	DOE/CS/30208—T1
AC03-79EV10023	Booz-Allen and Hamilton, Inc., Bethesda, MD (USA). Energy and Environment Div.	
	8:3034	DOE/EV/10023—T1
AC03-80SF11440	Proto-Power Management Corp., Groton, CT (USA)	
	8:2135	DOE/SF/11440—T2
AC03-81SF11492	Georgia Inst. of Tech., Atlanta (USA). Engineering Experiment Station	
	8:1988	DOE/SF/11492—T7
	Houston Univ., TX (USA)	
	8:1989	STTFUA—81-19
	Institute of Gas Technology, Chicago, IL (USA)	
	8:2006	DOE/SF/11492—T3
AC04-76DP00053	Monsanto Research Corp., Miamisburg, OH (USA). Mound Facility	
	8:1743	MLM—2997-OP
	Mound Facility, Miamisburg, OH (USA)	
	8:1744	MLM—3017(OP)
	Monsanto Research Corp., Miamisburg, OH (USA). Mound Facility	
	8:1826	MLM—2995-OP
	8:2022	Solar Energy Materials 6 NO. 4. 481-490 (May-Jun 1982).

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	Mound Facility, Miamisburg, OH (USA)	
	8:2586	MLM—2944
	Dayton Univ., OH (USA). Research Inst.	
	8:2627	MLM—2996-OP
AC04-76DP00487	Mason and Hanger-Silas Mason Co., Inc., Amarillo, TX (USA)	
	8:2928	MHSMP—82-33
	8:2929	MHSMP—82-34
	8:2930	MHSMP—82-37
	8:2931	MHSMP—82-38
AC04-76DP00613	Bendix Corp., Kansas City, MO (USA)	
	8:2755	BDX—613-2833
AC04-76DP00656	General Electric Co., St. Petersburg, FL (USA). Neutron Devices Dept.	
	8:2708	GEPP-OP—565
AC04-76DP00789	Sandia National Labs., Albuquerque, NM (USA)	
	8:1553	SAND—82-1924
	8:1640	SAND—82-1336
	8:1667	SAND—82-2243C
	8:1713	SAND—82-1417
	8:1770	SAND—82-0962
	8:1771	SAND—82-1839C
	8:1772	SAND—82-2192C
	Sandia National Labs., Livermore, CA (USA)	
	8:1848	SAND—82-8776
	Sandia National Labs., Albuquerque, NM (USA)	
	8:1884	SAND—82-2219C
	8:1885	SAND—82-2220C
	Solarex Corp., Rockville, MD (USA)	
	8:1937	SAND—80-7075
	Sandia National Labs., Albuquerque, NM (USA)	
	8:1938	SAND—82-0514C
	8:1939	SAND—82-0539C
	8:1940	SAND—82-0732
	8:1941	SAND—82-1031C
	8:1942	SAND—82-1701
	8:1943	SAND—82-1744
	8:1944	SAND—82-2162C
	8:1945	SAND—82-2218C
	Boeing Computer Services Co., Seattle, WA (USA)	
	8:1976	SAND—81-7080/2
	8:1977	SAND—81-7085/13
	8:1978	SAND—81-7091/3
	Sandia National Labs., Albuquerque, NM (USA)	
	8:1979	SAND—82-0540C
	8:1980	SAND—82-2119C
	8:1981	SAND—82-2135C
	8:1982	SAND—82-2217C
	McDonnell Douglas Astronautics Co., Huntington Beach, CA (USA)	
	8:2018	SAND—81-7029
	Sandia National Labs., Albuquerque, NM (USA)	
	8:2019	SAND—82-1714
	Boeing Engineering and Construction Co., Seattle, WA (USA)	
	8:2020	SAND—82-7102
	Swedlow, Inc., Garden Grove, CA (USA)	
	8:2021	SAND—82-7121
	Worcester Polytechnic Inst., Holden, MA (USA). Alden Research Lab.	
	8:2313	NUREG/CR—2761
	Sandia National Labs., Albuquerque, NM (USA)	
	8:2314	NUREG/CR—2787
	8:2316	SAND—82-0980
	8:2317	SAND—82-1212A
	8:2318	SAND—82-1325C
	8:2319	SAND—82-1969C
	8:2320	SAND—82-2078C
	8:2321	SAND—82-2120C
	8:2322	SAND—82-2129C
	8:2323	SAND—82-2161C
	8:2324	SAND—82-2181C
	8:2325	SAND—82-2182C
	8:2326	SAND—82-2183C

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	8:2327	SAND—82-2202C
	8:2328	SAND—82-2269C
	8:2329	SAND—82-2285C
	8:2590	SAND—82-0364C
	8:2657	SAND—82-1296C
	8:2658	SAND—82-1297C
	8:2659	SAND—82-1367C
	8:2660	SAND—82-1959C
	8:2717	SAND—82-1087
	8:2718	SAND—82-1284C
	8:2719	SAND—82-1542
	8:2760	SAND—82-1323C
	8:2932	SAND—81-2173
	8:2933	SAND—82-1491C
	8:2985	SAND—82-1773
	8:3104	SAND—82-2194
	Washington Univ., Seattle (USA). Applied Physics Lab.	
	8:3116	SAND—82-7048
	Sandia National Labs., Albuquerque, NM (USA)	
	8:3178	SAND—82-1698C
	8:3179	SAND—82-2299C
	8:3738	SAND—82-2016C
	Sandia Labs., Albuquerque, NM (USA)	
	8:3870	SAND—82-1354
	Sandia National Labs., Albuquerque, NM (USA)	
	8:3891	SAND—82-0853
	8:3892	SAND—82-0984
	8:3893	SAND—82-1976
	Sandia National Labs., Livermore, CA (USA)	
	8:3894	SAND—82-8009
AC04-76DP03533	**Rockwell International Corp., Golden, CO (USA). Rocky Flats Plant**	
	8:1726	DOE/TRU—8202
	8:1761	RFP—3267
	8:1968	Praktiker 9 202-203 (1974).
	Rockwell International Corp., Golden, CO (USA). Energy Systems Group	
	8:2385	RFP—3320
	8:2614	Revue de l'Aluminium 379-383 (Aug-Sep 1980).
	Rockwell International Corp., Golden, CO (USA). Rocky Flats Plant	
	8:2912	RFP—3391
	8:2923	RFP—3380
	8:3023	Kankyo Shisetsu NO. 3. 44-48 (1981).
	8:3024	Kagaku Kyoiku 28 95-99 (1980).
AC04-78AL04272	**Aluminum Co. of America, Alcoa Center, PA. Alcoa Labs.**	
	8:2051	ALO—4272-T1
AC04-78ET20536	**Jet Propulsion Lab., Pasadena, CA (USA)**	
	8:1911	DOE/JPL—1012-76
AC05-76OR00033	**Oak Ridge Associated Universities, Inc., TN (USA)**	
	8:2096	ORAU—205
AC05-77ET10152	**Hydrocarbon Research, Inc., Lawrenceville, NJ (USA)**	
	8:1517	DOE/ET/10152—79
	8:1518	DOE/ET/10152—84
AC05-78OR03054	**International Coal Refining Co., Allentown, PA (USA)**	
	8:1531	DOE/OR/03054—T13-Vol.1
	8:1532	DOE/OR/03054—T13-Vol.2
AC05-82NE50008	**Stoller (S.M.) Corp., New York (USA)**	
	8:2181	DOE/NE/50008—T1
AC06-76FF02170	**Hanford Engineering Development Lab., Richland, WA (USA)**	
	8:2246	HEDL-SA—2612-FP
	8:2247	HEDL-SA—2664-FP
	8:2248	HEDL-SA—2694
	Argonne National Lab., IL (USA)	
	8:2288	HEDL-SA—2724-FP
	Hanford Engineering Development Lab., Richland, WA (USA)	
	8:2289	HEDL-SA—2725
	8:2290	HEDL-TME—75-98
	8:3350	HEDL-SA—2703FP
	8:3351	HEDL-SA—2704-FP
AC06-76RL01830	**Pacific Northwest Lab., Richland, WA (USA)**	
	8:1552	PNL—4230
	8:1644	PNL—3991
	8:1663	PNL—4014
	8:1664	PNL—4090
	8:1665	PNL—4153
	8:1712	PNL-SA—10372
	Pennsylvania State Univ., University Park (USA). Materials Research Lab.	
	8:1749	ONWI—202
	Pacific Northwest Lab., Richland, WA (USA)	
	8:1751	PNL—4254
	8:1752	PNL—4366
	8:1753	PNL—4428-Vol.1
	8:1754	PNL—4428-Vol.2
	8:1755	PNL-SA—10290
	8:1756	PNL-SA—10295
	8:1757	PNL-SA—10700
	8:1758	PNL-SA—10701
	8:1790	NUREG/CR—2873-Vol.2
	8:1791	PNL-SA—10548-S
	Battelle Pacific Northwest Labs., Richland, WA (USA)	
	8:1823	NUREG/CR—2820
	Pacific Northwest Lab., Richland, WA (USA)	
	8:1935	PNL-SA—9954-Rev.1
	8:1936	PNL-SA—10350
	8:2048	PNL—4361
	8:2053	PNL—4431
	8:2099	DOE/ET/34215—25
	8:2100	DOE/ET/34215—27
	8:2104	PNL-SA—10153
	8:2105	PNL-SA—10341
	8:2174	PNL-SA—10369
	8:2175	PNL-SA—10370
	8:2176	PNL-SA—10371
	8:2256	PNL—4314
	8:2347	PNL-SA—10076
	8:2348	PNL-SA—10166
	8:2349	PNL-SA—10591
	8:2350	PNL-SA—10593
	8:2357	PNL-SA—10531
	8:2358	PNL-SA—10636
	8:2384	PNL—4255
	Battelle Pacific Northwest Labs., Richland, WA (USA)	
	8:2395	EPRI-NP—2562
	Pacific Northwest Lab., Richland, WA (USA)	
	8:2471	PNL-SA—10584
	8:2472	PNL-SA—10644
	General Energy Associates, Philadelphia, PA (USA)	
	8:2510	PNL—4416-Vol.1
	Pacific Northwest Lab., Richland, WA (USA)	
	8:2752	PNL-SA—10446
	8:2906	PNL—3736
	8:3008	PNL—4278
	8:3021	PNL-SA—10423
	Law Engineering Testing Co., Marietta, GA (USA)	
	8:3107	ONWI—277
	Terra Tek, Inc., Salt Lake City, UT (USA)	
	8:3112	ONWI—260
	8:3113	ONWI—308
	Pacific Northwest Lab., Richland, WA (USA)	
	8:3830	PNL-SA—10300
AC06-76RL01857	**UNC Nuclear Industries, Inc., Richland, WA (USA)**	
	8:1774	UNI—1692-Rev.1
	8:2212	UNI-SA—104
AC06-77ET33047	**Mathematical Sciences Northwest, Inc., Bellevue, WA (USA)**	
	8:2729	DOE/ET/33047—1

Contract No.	Abstract No.	Report No.
AC06-77RL01030	Rockwell International Corp., Richland, WA (USA). Energy Systems Group	
	8:1762	RHO-BW-SA—220P
	8:1763	RHO-BW-SA—243-P
	8:1764	RHO-BW-SA—248-P
	8:1765	RHO-BW-SA—250-P
	Rockwell International Corp., Richland, WA (USA). Rockwell Hanford Operations	
	8:1766	RHO-BW-SA—276P
	Woodward-Clyde Consultants, San Francisco, CA (USA)	
	8:1767	RHO-BWI-C—107-Vol.1
	8:1768	RHO-BWI-C—107-Vol.2
	Rockwell International Corp., Richland, WA (USA). Rockwell Hanford Operations	
	8:1769	RHO-BWI-LD—32
	Rockwell International Corp., Canoga Park, CA (USA). Energy Systems Group	
	8:1792	RHO-SA—255P
	Rockwell International Corp., Richland, WA (USA). Rockwell Hanford Operations	
	8:1824	RHO-CD—1106-Rev.1
AC06-79ET34026	Exxon Nuclear Co., Inc., Richland, WA (USA)	
	8:2097	DOE/ET/34026—5
AC06-81ER40048	Washington Univ., Seattle (USA). Dept. of Physics	
	8:3534	DOE/ER/40048—82-PT8
AC07-76ID01570	EG and G Idaho, Inc., Idaho Falls (USA)	
	8:1728	EGG-M—07182
	8:1729	EGG-M—18282
	8:1730	EGG-M—18982
	8:1731	EGG-M—19282
	Idaho National Engineering Lab., Idaho Falls (USA)	
	8:1732	EGG-M—19482
	EG and G Idaho, Inc., Idaho Falls (USA)	
	8:1733	EGG-M—20282
	Idaho National Engineering Lab., Idaho Falls (USA)	
	8:1871	EGG-HYD—6024
	8:2043	EGG—2215-Vol.2
	EG and G Idaho, Inc., Idaho Falls (USA)	
	8:2102	EGG-M—03982
	8:2111	EGG-M—05582
	8:2112	EGG-M—10781
	8:2114	GEND-INF—025
	8:2219	EGG-M—11682
	Idaho National Engineering Lab., Idaho Falls (USA)	
	8:2233	EGG-EE—5924
	8:2234	EGG-EE—5965
	EG and G Idaho, Inc., Idaho Falls (USA)	
	8:2235	EGG-M—04382
	8:2236	EGG-M—07082
	8:2244	EGG-M—06582
	Idaho National Engineering Lab., Idaho Falls (USA)	
	8:2245	EGG-PR—5784
	EG and G Idaho, Inc., Idaho Falls (USA)	
	8:2262	EGG-M—9181
	8:2263	EGG-M—03482
	8:2264	EGG-M—03782
	8:2265	EGG-M—04082
	Hoffman Electronics Corp., Santa Barbara, CA (USA)	
	8:2266	EGG-M—04182
	EG and G Idaho, Inc., Idaho Falls (USA)	
	8:2267	EGG-M—04782
	8:2268	EGG-M—06682
	Idaho National Engineering Lab., Idaho Falls (USA)	
	8:2269	EGG-M—08581
	EG and G Idaho, Inc., Idaho Falls (USA)	
	8:2270	EGG-M—08781
	8:2271	EGG-M—15382
	8:2272	EGG-M—17082
	8:2273	EGG-M—17782
	Idaho National Engineering Lab., Idaho Falls (USA)	
	8:2274	EGG-PHYS—6012
	EG and G Idaho, Inc., Idaho Falls (USA)	
	8:2496	CONF-820814—34
	8:2707	EGG-ME—5929
	Idaho National Engineering Lab., Idaho Falls (USA)	
	8:3410	EGG-M—05982
	8:3411	EGG-M—17982
	EG and G Idaho, Inc., Idaho Falls (USA)	
	8:3764	EGG-M—06882
	8:3874	EGG-M—07582
AC07-77CS40327	Westinghouse Electric Corp., West Lafayette, IN (USA). Fluid Systems Lab.	
	8:2499	DOE/CS/40327—T2-Vol.1
	8:2500	DOE/CS/40327—T2-Vol.2
AC07-79ID01675	Exxon Nuclear Idaho Co., Inc., Idaho Falls (USA)	
	8:1734	ENICO—1120
AC08-76NV01183	EG and G, Inc., Goleta, CA (USA)	
	8:2865	CONF-821011—2
	EG and G, Inc., Las Vegas, NV (USA). Energy Measurements Group	
	8:2990	EGG—1183-1828
	EG and G, Inc., Albuquerque, NM (USA)	
	8:3873	EGG—1183-6003
AC08-78DP40030	KMS Fusion, Inc., Ann Arbor, MI (USA)	
	8:3819	KMSF-U—361-Rev.1
AC08-80DP40124	Rochester Univ., NY (USA). Lab. for Laser Energetics	
	8:3760	DOE/DP/40124—T1
AC08-81CS50152	Bendix Corp., Englewood, CO (USA). Energy, Environment, and Technology Office	
	8:2480	DOE/CS/50152—1
AC08-82DP40152	KMS Fusion, Inc., Ann Arbor, MI (USA)	
	8:3820	KMSF-U—1213
AC09-76SR00001	Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.	
	8:1695	DP-MS—82-39
	8:1727	DP—1631
AC09-76SR00819	Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Plant	
	8:1724	DOE/SR-WM—83-1
AC11-76PN00014	Bettis Atomic Power Lab., Pittsburgh, PA (USA)	
	8:2160	WAPD-TM—1378
	8:2161	WAPD-TM—1440
	Westinghouse Electric Corp., Pittsburgh, PA (USA). Bettis Atomic Power Div.	
	8:2162	WAPD-TM—1460
	Bettis Atomic Power Lab., Pittsburgh, PA (USA)	
	8:2163	WAPD-TM—1492
	8:2164	WAPD-TM—1506
	8:2165	WAPD-TM—1512
	8:2166	WAPD-TM—1527
AC13-76GJ01664	Bendix Field Engineering Corp., Grand Junction, CO (USA). Grand Junction Operations	
	8:1680	GJBX—193-82
	Bendix Field Engineering Corp., Grand Junction, CO (USA)	
	8:1681	GJBX—219(82)
	Bendix Field Engineering Corp., Grand Junction, CO (USA). Grand Junction Operations	
	8:1690	PGJ/F—083-82
	Golder Associates, Inc., Kirkland, WA (USA)	
	8:1691	PGJ/F—093-82
	Oklahoma Geological Survey, Norman (USA)	
	8:1692	PGJ/F—096-82
AC18-80FC10200	Radian Corp., Austin, TX (USA)	
	8:2072	DOE/FC/10200—T2
AC18-81FC10297	Georgia Inst. of Tech., Atlanta (USA)	
	8:1571	DOE/FC/10297—T3

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AC19-78SF01802	Gary Energy Corp., Englewood, CO (USA)	
	8:1637	DOE/SF/01802—61
AC19-80BC10033	Keplinger and Associates, Inc., Tulsa, OK (USA)	
	8:1635	DOE/BC/10033—4
AC21-80MC14603	Conspray Construction Systems, Inc., Santa Ana, CA (USA)	
	8:1527	DOE/MC/14603—T12
AC21-81FE05121	Mountain Fuel Resources, Inc., Salt Lake City, UT (USA)	
	8:1526	DOE/FE/05121—T4
AC21-81FE16123	BENMOL Corp., Alexandria, VA (USA)	
	8:2762	DOE/FE/16123—T1
AC21-81MC16026	Massachusetts Inst. of Tech., Cambridge (USA)	
	8:1528	DOE/MC/16026—3-4
AC21-81MC16242	Physical Sciences, Inc., Woburn, MA (USA)	
	8:2441	DOE/MC/16242—4
AC21-81MC16372	Westinghouse Electric Corp., Pittsburgh, PA (USA). Research and Development Center	
	8:1529	DOE/MC/16372—5
AC22-76ET10144	Rockwell International Corp., Canoga Park, CA (USA). Energy Systems Group	
	8:1547	ESG-DOE—13384
AC22-79ET14809	Brigham Young Univ., Provo, UT (USA)	
	8:1854	DOE/ET/14809—11
AC22-80PC30018	Rockwell International Corp., Canoga Park, CA (USA). Energy Systems Group	
	8:1533	DOE/PC/30018—2
AC22-80PC30021	Air Products and Chemicals, Inc., Allentown, PA (USA)	
	8:1855	DOE/PC/30021—T10
AC22-80PC30337	Pittsburgh Univ., PA (USA)	
	8:1535	DOE/PC/30337—T1
AC22-81PC40090	Mechanical Technology, Inc., Latham, NY (USA)	
	8:1548	MTI/WDC—82-TR-517
AC22-81PC40502	TRW Energy Development Group, Redondo Beach, CA (USA)	
	8:2445	MHD-III—82-101
AC22-81PC41035	New Hampshire Univ., Durham (USA). Dept. of Chemical Engineering	
	8:1540	DOE/PC/41035—4
AC22-81PC42682	Dynamac Corp., Rockville, MD (USA). Enviro Control Div.	
	8:1572	DOE/PC/42682—T3
AC97-80ET46617	Texas Univ., Austin (USA). Bureau of Economic Geology	
	8:3106	DOE/ET/46617—T2
AI01-76ET20307	Jet Propulsion Lab., Pasadena, CA (USA)	
	8:1986	DOE/JPL—1060-53-Vol.1
	8:1987	DOE/JPL—1060-53-Vol.2
AI01-76ET20320	National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center	
	8:2052	DOE/NASA/20320—41
AI01-77CS51040	Mechanical Technology, Inc., Latham, NY (USA)	
	8:2535	DOE/NASA/0032—17
	8:2536	DOE/NASA/0032—18
AI01-77CS51044	National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center	
	8:2537	DOE/NASA/51044—25
	8:2538	DOE/NASA/51044—28
AI01-77ET10350	National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center	
	8:1530	DOE/NASA/10350—30
AI01-77ET12547	Jet Propulsion Lab., Pasadena, CA (USA)	
	8:1525	DOE/ET/12547—2
AI01-77ET13111	General Electric Co., Schenectady, NY (USA)	
	8:1625	DOE/NASA/13111—11
	United Technologies Corp., East Hartford, CT (USA). Research Center	
	8:1626	DOE/NASA/13111—12
AI01-78CS40090	Department of Agriculture, Albany, CA (USA). Western Regional Research Center	
	8:2498	DOE/CS/40090—T1
AI01-79EV10034	Environmental Protection Agency, Washington, DC (USA)	
	8:2387	DOE/EV/10034—T1-Vol.1-Exec.Summ.
AI01-79EV10094	Department of Agriculture, Fargo, ND (USA). Metabolism and Radiation Research Lab.	
	8:3056	DOE/EV/10094—T1
AI01-81CS30661	Department of Commerce, Washington, DC (USA). Bureau of Economic Analysis	
	8:2004	DOE/CS/30661—T1
AI04-80AL12726	National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center	
	8:2447	DOE/NASA/12726—17
AI07-80ID12138	Jet Propulsion Lab., Pasadena, CA (USA)	
	8:2502	DOE/ID/12138—2
AI08-76DP00351	National Oceanic and Atmospheric Administration, Las Vegas, NV (USA). Weather Service Nuclear Support Office	
	8:2947	NVO—249
AI08-78ET44802	Geological Survey, Menlo Park, CA (USA)	
	8:1776	USGS-OFR—82-701
	8:1777	USGS-OFR—82-931
AI08-79DP40092	Naval Research Lab., Washington, DC (USA)	
	8:3825	NRL-MR—4900
AI08-81DP40148	National Bureau of Standards, Washington, DC (USA). Center for Electronics and Electrical Engineering	
	8:3761	DOE/DP/40148—1
AI13-78GJ01686	Geological Survey, Menlo Park, CA (USA)	
	8:1684	PGJ/F—010-82
	Geological Survey, Golden, CO (USA)	
	8:1685	PGJ/F—044-82
	8:1686	PGJ/F—049-82
	8:1687	PGJ/F—055-82
	8:1688	PGJ/F—078-82
	8:1689	PGJ/F—079-82
AM01-76EI02295	Massachusetts Inst. of Tech., Cambridge (USA)	
	8:2308	MIT-EL—82-023
AM03-76SF00767	California Inst. of Tech., Pasadena	
	8:2684	Journal of the American Chemical Society 104 NO. 12. 3280-3287 (16 Jun 1982).
AM03-77SF01484	Utah Univ., Salt Lake City (USA). Dept. of Mining and Fuels Engineering	
	8:1546	DOE/SF/01484—T4
AP03-79SF10888	Commercilization Insights, Tampa, FL (USA)	
	8:1638	DOE/SF/10888—T1
AS05-76ER03612	Maryland Univ., College Park (USA)	
	8:2557	DOE/ER/03612—15
AS05-76ER03924	Texas A and M Univ., College Station (USA). Cyclotron Inst.	
	8:3252	DOE/ER/03924—T1
AS05-76ER04043	Virginia Univ., Charlottesville (USA). Dept. of Physics	
	8:3261	DOE/ER/04043—42
AS05-76ER04311	Florida Univ., Gainesville (USA). Engineering and Industrial Experiment Station	
	8:2558	DOE/ER/04311—T1
AS05-76ER04322	Texas A and M Univ., College Station (USA). Cyclotron Inst.	
	8:3253	DOE/ER/04322—T3

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AS05-76ER04676	Rice Univ., Houston, TX (USA). Dept. of Physics	
	8:3156	DOE/ER/04676—8
AS05-76ER04953	Memphis State Univ., TN (USA). Center for Nuclear Studies	
	8:2093	DOE/ER/04953—T1
AS05-76ER05096	Rice Univ., Houston, TX (USA). Dept. of Physics	
	8:3199	DOE/ER/05096—10
AS05-76ER05126	Maryland Univ., College Park (USA). Dept. of Physics and Astronomy	
	8:3425	DOE/ER/05126—158
AS05-76EV03408	Texas Univ., Austin (USA). Lab. of Radiation Biology	
	8:3063	DOE/EV/03408—26
AS05-77ER05462	Texas Univ., Austin (USA). Dept. of Chemistry	
	8:2686	DOE/ER/05462—T1
AS05-78ER06039	Virginia Polytechnic Inst. and State Univ., Blacksburg (USA). Coll. of Engineering	
	8:2554	CONF-811037—4
	Virginia Polytechnic Inst. and State Univ., Blacksburg (USA). Dept. of Materials Engineering	
	8:2559	DOE/ER/06039—T1
AS05-78ET12313	Colorado School of Mines, Golden (USA). Dept. of Metallurgial Engineering	
	8:2562	DOE/ET/12313—4
AS05-78ET20322	Mississippi State Univ., Mississippi State (USA). Energy Research Center	
	8:2005	DOE/RA/20322—1
AS05-78EV05855	Florida State Univ., Tallahassee (USA)	
	8:2664	DOE/EV/05855—T1
AS07-77ET28365	Colorado Geological Survey, Denver (USA)	
	8:2024	DOE/ET/28365—9
	8:2025	DOE/ET/28365—12-MAP
	8:2026	DOE/ET/28365—13-MAP
	8:2027	DOE/ET/28365—17
	8:2028	DOE/ET/28365—18
	8:2031	DOE/ET/28365—10
	8:2033	DOE/ET/28365—15
AS07-80ID12172	Oklahoma Geological Survey, Norman (USA)	
	8:2029	DOE/ID/12172—T1
AS08-81DP40160	Wisconsin Univ., Madison (USA). Dept. of Nuclear Engineering	
	8:3762	DOE/DP/40160—1
AS08-81DP40161	Wisconsin Univ., Madison (USA). Dept. of Nuclear Engineering	
	8:3763	DOE/DP/40161—1
AS09-77ER01023	Georgia Univ., Athens (USA). Dept. of Physics	
	8:2556	DOE/ER/01023—5
AT03-76ET35301	General Atomic Co., San Diego, CA (USA)	
	8:2136	GA-A—16792
	8:2284	GA-A—16869
AT03-76ET51011	General Atomic Co., San Diego, CA (USA)	
	8:3773	GA-A—16816
AT03-76ET52015	Rockwell International Corp., Canoga Park, CA (USA). Energy Systems Group	
	8:2563	DOE/ET/52015—T20
AT03-76EV70134	California Univ., Los Angeles (USA)	
	8:3019	CONF-8205127—1
AT03-76SF70046	General Atomic Co., San Diego, CA (USA)	
	8:2283	GA-A—16868
AT03-76SF71053	General Atomic Co., San Diego, CA (USA)	
	8:1735	GA-A—16852
AT03-79ER10376	SRI International, Menlo Park, CA (USA)	
	8:3547	DOE/ER/10376—T2
AT03-79PE70117	Stanford Univ., CA (USA). Inst. for Energy Studies	
	8:2416	CONF-811267—Summ.
AT03-81ER10870	California Inst. of Tech., Pasadena (USA). W.M. Keck Lab. of Engineering Materials	
	8:2553	CALT—822-134
AT06-76ER70031	Washington Univ., Seattle (USA). Dept. of Nuclear Engineering	
	8:3409	DOE/ER/70031—9
AT21-80MC14718	West Virginia Univ., Morgantown (USA). Dept. of Physics	
	8:1565	DOE/MC/14718—1213
FC02-79CS30278	Colorado State Univ., Fort Collins (USA). Solar Energy Applications Lab.	
	8:1994	CONF-810125—3
	Arizona State Univ., Tempe (USA). Coll. of Architecture	
	8:1995	CONF-810125—4
	Tennessee Univ., Knoxville (USA). Energy, Environment and Resources Center	
	8:1996	CONF-810125—5
	Yale Univ., New Haven, CT (USA)	
	8:1997	CONF-810125—6
FC02-80CS30533	Sunspool Corp., Palo Alto, CA (USA)	
	8:2003	DOE/CS/30533—1
FC02-80ET14759	Grace (W.R.) and Co., Memphis, TN (USA)	
	8:1849	DOE/ET/14759—T4-13a
	Grace (W.R.) and Co., Memphis, TN (USA). Agricultural Chemicals Group	
	8:1851	DOE/ET/14759—T7-36
	Grace (W.R.) and Co., Memphis, TN (USA)	
	8:1852	DOE/ET/14759—T9-27B
	Grace (W.R.) and Co., Memphis, TN (USA). Agricultural Chemicals Group	
	8:1853	DOE/ET/14759—T10-35
FC02-81RA50404	WyCoalGas, Inc., Douglas, WY (USA)	
	8:1541	DOE/RA/50404—1232-App.A-Vol.1
	8:1542	DOE/RA/50404—1232-App.D-Vol.3
	8:1543	DOE/RA/50404—1232-App.L
	Williams-Kuebelbeck and Associates, Inc., Marina Del Rey, CA (USA)	
	8:1544	DOE/RA/50404—1232-App.P
	WyCoalGas, Inc., Douglas, WY (USA)	
	8:1545	DOE/RA/50404—1232-App.Q.Vol.6
	8:1585	DOE/RA/50404—1232-App.B-Vol.1
	8:1586	DOE/RA/50404—1232-App.B-Vol.2
	8:1587	DOE/RA/50404—1232-App.Q-Vol.1
	8:1588	DOE/RA/50404—1232-App.Q-Vol.2
	8:1589	DOE/RA/50404—1232-App.Q-Vol.3
	8:3031	DOE/RA/50404—1232-App.D-Vol.4
	8:3032	DOE/RA/50404—1232-App.D-Vol.5
FC05-77ET10069	Exxon Research and Engineering Co., Florham Park, NJ (USA)	
	8:1516	DOE/ET/10069—T22
FC07-79ET27034	Alaska Univ., Fairbanks (USA)	
	8:2032	DOE/ET/27034—T2
FC07-79ID12018	Colorado Geological Survey, Denver (USA)	
	8:2041	DOE/ID/12018—12
FC07-79RA23210	James River Corp., Berlin, NH (USA). Engineering Dept.	
	8:1873	DOE/RA/23210—2
FG01-79CS20244	Mitre Corp., Bedford, MA (USA)	
	8:2521	MTR—81W00127
FG01-79CS20291	Pacific Gas and Electric Co., San Francisco, CA (USA)	
	8:1897	DOE/CS/20291—3
FG01-80CS40338	North Carolina State Government, Raleigh (USA)	
	8:1648	DOE/CS/40338—2
FG01-80CS65004	Cooper Union Research Foundation, New York (USA)	
	8:2369	DOE/CS/65004—T1
FG01-80RA50296	Huntsville, City of, AL (USA)	
	8:2518	DOE/CS/50296—1
	8:2519	DOE/CS/50296—5

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FG02-81R510294		Shawnee Solar Project, Carbondale, IL (USA). Demonstration and Resource Center
	8:2462	DOE/R5/10294—2
FG05-80ET53088		Texas Univ., Austin (USA). Inst. for Fusion Studies
	8:3554	DOE/ET/53088—35
	8:3555	DOE/ET/53088—68
FG06-77ET20181		Alaska, University, Fairbanks, Alaska
	8:1880	Solar Energy 25 NO. 2. 131-138 (1980).
FG07-80RA50316		Biomass Energy Systems, Inc., Lakeland, FL (USA)
	8:1914	DOE/RA/50316—T1-Attach.1
	8:1915	DOE/RA/50316—T1-Attach.3
	8:1916	DOE/RA/50316—T1-Attach.7
	8:1917	DOE/RA/50316—T1-Attach.8
	8:1918	DOE/RA/50316—T1-Vol.1
FG07-80RA50330		New Energy Corp. of Indiana, Washington, DC (USA)
	8:1919	DOE/RA/50330—1
	8:1920	DOE/RA/50330—1-Attach.5
	8:1921	DOE/RA/50330—1-Vol.1-Attach.4
		McKee (Davy) Corp., Chicago, IL (USA)
	8:1971	DOE/RA/50330—1-Attach.2
FG07-81ID12274		Chemapec Associates, New York (USA)
	8:1901	DOE/ID/12274—T1-Vol.1
	8:1902	DOE/ID/12274—T1-Vol.2
	8:1903	DOE/ID/12274—T1-Vol.3
		Singmaster and Breyer, New York (USA)
	8:1904	DOE/ID/12274—T1-Vol.4
		Chemapec Associates, New York (USA)
	8:1905	DOE/ID/12274—T1-Vol.5
FG07-81ID12276		Louisiana Bio-Fuel, Inc., Metairie (USA)
	8:1906	DOE/ID/12276—T1-Bk.1
	8:1907	DOE/ID/12276—T1-Bk.2
	8:1908	DOE/ID/12276—T1-Bk.3
FG07-81ID12277		Sun Belt Energy Corp., Sardis, MS (USA)
	8:1909	DOE/ID/12277—T1-Vol.1
	8:1910	DOE/ID/12277—T1-Vol.2
FG07-81ID12329		Alabama Univ., Huntsville (USA). Kenneth E. Johnson Environmental and Energy Center
	8:2545	DOE/ID/12329—T1
FG07-81ID12348		Kentucky Dept. for Natural Resources and Environmental Protection, Frankfort (USA)
	8:1722	DOE/ID/12348—T3
FG07-81RA50338		Process Plants, Inc., Houston, TX (USA)
	8:1922	DOE/RA/50338—1-Vol.1-Attach.A
		Badger America, Inc., Tampa, FL
	8:1923	DOE/RA/50338—1-Vol.2-Attach.B
FG22-80PC30249		Oklahoma Univ., Norman (USA). School of Chemical Engineering and Materials Science
	8:1534	DOE/PC/30249—T4
FG22-81PC40771		Massachusetts Inst. of Tech., Cambridge (USA)
	8:1856	DOE/PC/40771—6
FG22-81PC40786		Brown Univ., Providence, RI (USA). Div. of Engineering
	8:1537	DOE/PC/40786—4
FG22-81PC40796		Naples Univ. (Italy)
	8:1538	DOE/PC/40796—3
FG22-81PC40797		Rhode Island Univ., Kingston (USA). Dept. of Chemical Engineering
	8:1539	DOE/PC/40797—4
FG22-82PC52274		Southern Illinois Univ., Carbondale (USA). Coal Extraction and Utilization Research Center
	8:1606	DOE/PC/52274—T1
NAS-7-100-954929		Clemson Univ., SC (USA). Dept. of Electrical and Computer Engineering
	8:1912	DOE/JPL/954929—82/9
NAS-7-100-955843		Westinghouse Research and Development Center, Pittsburgh, PA (USA)
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82-029	NTIS (US Sales Only), PC A05/MF A01	DE82750554	MN -59a	8:1992
82-030	NTIS (US Sales Only), PC A06/MF A01	DE82750555	MN -94c	8:2362
82-031	NTIS (US Sales Only), PC A10/MF A01	DE82750556	MN -90e	8:1624
82-032	NTIS (US Sales Only), PC A09/MF A01	DE82750557	MN -94a	8:2354
82-033	NTIS (US Sales Only), PC A04/MF A01	DE82750581	MN -38	8:2551
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82-042	NTIS (US Sales Only), PC A06/MF A01	DE82750640	MN 97d	8:2495
82-045	NTIS (US Sales Only), PC A03/MF A01	DE82750641	MN -63c	8:2013
82-047	NTIS (US Sales Only), PC A04/MF A01	DE82750642	MN -62	8:1985
82-049	NTIS (US Sales Only), PC A07/MF A01	DE82750643	MN -38	8:2756
82-050	NTIS (US Sales Only), PC A04/MF A01	DE82750644	MN -38	8:2757
82-052	NTIS (US Sales Only), PC A03/MF A01	DE82750645	MN -38	8:2758
82-058	NTIS (US Sales Only), PC A04/MF A01	DE82750651	MN -88	8:1601
82-059	NTIS (US Sales Only), PC A06/MF A01	DE82750650	MN -59c	8:2014
82-062	NTIS (US Sales Only), MF A01	DE82750654	MN -34B	8:3110
BNL-				
31394	NTIS, PC A02/MF A01	DE83000716	MN -28	8:2852
31396	NTIS, PC A03/MF A01	DE83000717	MN -28	8:2797
31782	NTIS, PC A02/MF A01	DE83000211	MN -28	8:3211
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31987	NTIS, PC A02/MF A01	DE83001305	MN -34D	8:3212
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51560	NTIS, PC A02/MF A01	DE83001850	MN -61a	8:1894
51564	NTIS, PC A02/MF A01	DE83002343	STD -59c	8:1993
BNL-NCS-				
31877	NTIS, PC A02/MF A01	DE83000711	MN -34C	8:3325
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822-134	NTIS, PC A02/MF A01	DE83000629	MN -25	8:2553
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006/ 81	NTIS (US Sales Only), PC A02/MF A01	DE82703153	MN -34D	8:3213
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CEA-R-5146	NTIS (US Sales Only), PC A02/MF A01	DE82702804	MN -34C	8:3381
5171	NTIS (US Sales Only), PC A03/MF A01	DE82702995	MN -20	8:3153
CERN-EP-81-137	NTIS (US Sales Only), PC A02/MF A01	DE83900232	MN -34D	8:3192
CGR/DC-29/ 81	*See* AD-A-112151/6			8:1972
CNEN-RT/ING-81-19	NTIS (US Sales Only), PC A03/MF A01	DE83900229	MN -22	8:1694
CONF-751130-	(APS meeting, St. Petersburg, FL, USA, 10-14 Nov 1975)			
46-Rev.1	*See* KMSF-U-361-Rev.1	DE83000035	MN -21	8:3819
CONF-780407-	(Symposium on design, construction and operating experience of demonstration liquid metal fast breeder reactors, Bologna, Italy, 10-14 Apr 1978)			
18-Trans.	*See* RISLEY-Trans-3316	DE82905458	MN -79k	8:2145
CONF-780928-	(ANS meeting on environmental aspects of non-conventional energy resources, Denver, CO, USA, 26-29 Sep 1978)			
	La Grange Park, IL; American Nuclear Society (1978).			8:3037
CONF-790115-	(New York Academy of Sciences conference on aerosols: anthropogenic and natural-sources and transport, New York, NY, USA, 9-12 Jan 1979)			
	Ann. N.Y. Acad. Sci., 39-49(1980)			8:2988
	Ann. N.Y. Acad. Sci., 219-232(1980)			8:2989
CONF-790418-	(Scanning electron microscopy conference, Washington, DC, USA, 16-20 Apr 1979)			
	Proc. Soc. Photo-Opt. Instrum. Eng., 67-74(1979)			8:3863
CONF-7910125-	(2. ICFA workshop on possibilities and limitations of accelerators and detectors, Les Diablerets, Switzerland, 4-9 Oct 1979)			
8	NTIS, PC A02/MF A01	DE82022252	MN -28	8:3193
CONF-7911178-	(Workshop on COST of production an feeding of single cell protein, Juelich, F.R. Germany, 14-16 Nov 1979)			
1	NTIS (US Sales Only), PC A02/MF A01	DE82904716	MN -61a	8:1896
CONF-800175-	(4. American Ceramic Society annual conference on composites and advanced materials, Cocoa Beach, FL, USA, 20-24 Jan 1980)			
	Ceram. Eng. Sci. Proc., 1: No. 7-8, 500-507(1980)			8:2448
CONF-800723-	(19. national heat transfer conference, Orlando, FL, USA, 27-30 Jul 1980)			
	Am. Soc. Mech. Eng., [Pap.], No. 80-HT-140, 1-5(Jul 1980)			8:3862
CONF-8007142-	(2. Brazilian congress on cell biology and 7. Brazilian colloquium on electron microscopy, Rio de Janeiro, Brazil, 23-27 Jul 1980)			
(Absts.)	*See* INIS-mf-7174	DE83780006	MN -48	8:3040
CONF-800806-	(15. intersociety energy conversion engineering conference, Seattle, WA, USA, 18-22 Aug 1980)			
	Proc., Intersoc. Energy Convers. Eng. Conf., 1: 1-10(1980)			8:1674
CONF-800932-	(2. joint Grenoble-Varenna international symposium on heating in toroidal plasmas, Como, Italy, 3-12 Sep 1980)			
Pt.2	*See* EUR-7425(Pt.2)	DE83780038	MN -20	8:3605
CONF-8009293-	(5. meeting of experts - environmental and safety aspects of the present large scale WECS, Munich, F.R. Germany, 25-26 Sep 1980)			
	See Juel-Spez-100		MN -60	8:2049
CONF-8011171-	(10. international symposium on selected topics of the interaction of fast neutrons and heavy ions with atomic nuclei, Gaussig, F.R. Germany, 17-21 Nov 1980)			
	See ZfK-459	DE83780037	MN -34C	8:3507
CONF-801276-	(Trends in the biology of fermentations for fuels and chemicals, Upton, NY, USA, 7-11 Dec 1980)			
	New York, NY; Plenum Press (1981).			8:1967
CONF-810125-	(Solar technology assessment conference, Orlando, FL, USA, 29-30 Jan 1981)			
3	NTIS, PC A03/MF A01	DE83001130	MN -59c	8:1994
4	NTIS, PC A04/MF A01	DE83001131	MN -59c	8:1995
5	NTIS, PC A05/MF A01	DE83001132	MN -59b	8:1996
6	NTIS, PC A04/MF A01	DE83000811	MN -59	8:1997
CONF-810325-	(Workshop on measurement of electrical quantities in pulse power systems, Boulder, CO, USA, 2-4 Mar 1981)			
	See DOE/DP/40148-1	DE82021322	MN -38	8:3761
CONF-8103138-	(Methane technology for agriculture conference, Ithaca, NY, USA, 17-19 Mar 1981)			
	See NRAES-13		ND -61	8:1858
CONF-810550-	(35. annual frequency control symposium, Philadelphia, PA, USA, 27-29 May 1981)			
3	*See* GEPP-OP-565	DE83000092	MN -38	8:2708
CONF-8106120-	(5. meeting of the international collaboration on advanced neutron sources, Julich, F.R. Germany, 22-26 Jun 1981)			
	See Juel-Conf-45	DE82780795	MN -28	8:2840

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CONF-8106164-	(National Bureau of Standards joint conferences: 8. symposium on thermophysical properties; 17. thermal conductivity conference; 8. thermal expansion conference, Gaithersburg, MD, USA, 15-18 Jun 1981)			
2	*See* KFK-3201	DE82750197	MN -25	8:2626
CONF-8106200-	(21. annual international conference on Canadian Nuclear Association and 2. annual conference on Canadian Nuclear Society, Ottawa, Canada, 8-10 Jun 1981)			
11	*See* INIS-mf-7276	DE83780063	MN -70	8:1739
12	*See* INIS-mf-7277	DE83780064	MN -70	8:1740
13	*See* INIS-mf-7264	DE83780065	MN -2	8:1719
14	*See* INIS-mf-7265	DE83780066	MN -2	8:2407
15	*See* INIS-mf-7266	DE83780067	MN -78	8:2408
16	*See* INIS-mf-7270	DE83780068	MN -2	8:2409
17	*See* INIS-mf-7271	DE83780069	MN -2	8:2410
18	*See* INIS-mf-7272	DE83780070	MN -2	8:2421
19	*See* INIS-mf-7282	DE83780071	MN -2	8:2425
20	*See* INIS-mf-7283	DE83780072	MN -2	8:2426
21	*See* INIS-mf-7284	DE83780073	MN -2	8:2411
22	*See* INIS-mf-7285	DE83780074	MN -2	8:2412
23	*See* INIS-mf-7281	DE83780077	MN -2	8:1809
CONF-8106210-	(European two-phase flow group meeting, Eindhoven, Netherlands, 2-5 Jun 1981)			
1	*See* GKSS-81/E/35	DE82750202	MN -38	8:2739
CONF-810759-	(Physics opportunities at ISABELLE summer workshop, Upton, NY, USA, 20-31 Jul 1981)			
19	*See* DESY-81-060	DE82750222	MN -34D	8:3217
CONF-810760-	(International conference on high energy physics, Lisbon, Portugal, 9-15 Jul 1981)			
11	*See* DESY-81-054	DE82750218	MN -34D	8:3195
CONF-810895-	(International symposium on lepton and photon interactions at high energies, Bonn, F.R. Germany, 24-29 Aug 1981)			
9	*See* DESY-81-059	DE82750224	MN -34D	8:3216
10	*See* BONN-HE-81-17	DE82750225	MN -34D	8:3230
19	*See* PITHA-81/33	DE83900234	MN -34D	8:3209
20	*See* CERN-EP-81-137	DE83900232	MN -34D	8:3192
CONF-810903-	(IEEE/PES conference, Minneapolis, MN, USA, 20-25 Sep 1981)			
3	NTIS MF A01	DE83001376	MN -97a	8:2082
CONF-8109120-	(Nuclear International Jura '81, Palma de Mallorca, Spain, 27 Sep-1 Oct 1981)			
17	*See* INIS-mf-7039	DE82780775	MN -2	8:1718
18	*See* INIS-mf-7027	DE82780776	MN -70	8:1798
19	*See* INIS-mf-7028	DE82780777	MN -70	8:1716
20	*See* INIS-mf-7034	DE82780778	MN -70	8:2293
21	*See* INIS-mf-7035	DE82780779	MN -2	8:2294
22	*See* INIS-mf-7036	DE82780780	MN -2	8:2295
23	*See* INIS-mf-7037	DE82780781	MN -2	8:1803
25	*See* INIS-mf-7040	DE82780783	MN -2	8:2296
26	*See* INIS-mf-7023	DE82780784	MN -2	8:2402
27	*See* INIS-mf-7024	DE82780785	MN -2	8:2403
28	*See* INIS-mf-7025	DE82780786	MN -16	8:1796
29	*See* INIS-mf-7026	DE82780787	MN -86	8:1797
30	*See* INIS-mf-7029	DE82780788	MN -15	8:1799
31	*See* INIS-mf-7030	DE82780789	MN -15	8:1800
32	*See* INIS-mf-7031	DE82780790	MN -15	8:1801
33	*See* INIS-mf-7032	DE82780791	MN -15	8:1802
34	*See* INIS-mf-7033	DE82780792	MN -15	8:1717
CONF-8109185-	(EPRI technology transfer workshop, Seattle, WA, USA, 17-18 Sep 1981)			
	See EPRI-NP-2562	DE83001224	MN -2	8:2395
CONF-811037-	(TMS/AIME fall meeting on advanced techniques for the characterization of hydrogen in metals, Louisville, KY, USA, 11-15 Oct 1981)			
4	NTIS, PC A02/MF A01	DE83001158	MN -25	8:2554
5	NTIS, PC A03/MF A01	DE83001894	MN -25	8:2555
CONF-811040-	(9. symposium on engineering problems of fusion research, Chicago, IL, USA, 26-29 Oct 1981)			
188	NTIS, PC A02/MF A01	DE83001883	MN -20a	8:3758
CONF-811046-	(Meeting and workshop on fusion reactor design and technology, Tokyo, Japan, 5-16 Oct 1981)			
18	*See* IPP-2/256	DE82750532	MN -20d	8:3814
CONF-8110104-	(3. international ocean dumping symposium, Woods Hole, MA, USA, 12-16 Oct 1981)			
5	NTIS, PC A05/MF A01	DE83001896	MN -11	8:3018
CONF-8110137-	(Symposium on resource recovery and environmental issues of industrial solid wastes, Gatlinburg, TN, USA, 28-30 Oct 1981)			
3	NTIS, PC A02/MF A01	DE83001928	MN -95f	8:2667
CONF-8110178-	(5. GRS-expert's conference on advances in safety evaluation of nuclear power plants, Munich, F.R. Germany, 22-23 Oct 1981)			
1	*See* INIS-mf-6975	DE82780762	MN -41	8:2340
2	*See* INIS-mf-6976	DE82780763	MN -41	8:2341
3	*See* INIS-mf-6978	DE82780764	MN -41	8:2343

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4	*See* INIS-mf-6979	DE82780765	MN -41	8:2344
5	*See* INIS-mf-7013	DE82780766	MN -41	8:2094
6	*See* INIS-mf-6977	DE82780772	MN -78	8:2342
CONF-8110227-	(11. international seminar on quantum gravity, Moscow, USSR, 13-16 Oct 1981)			
1	*See* JINR-E-2-81-854	DE82702986	MN -34D	8:3242
CONF-8110229-	(Technical meeting on radio frequency heating in large fusion experiments, Princeton, NJ, USA, 19-22 Oct 1981)			
Exc.	*See* EUR-CEA-FC-1142	DE82703135	MN -20	8:3607
CONF-8110233-	(4. Philip Morris science symposium, Richmond, VA, USA, 29 Oct 1981)			
1	*See* BNL-31911	DE83000710	MN -4	8:3044
CONF-8110237-	(Appliachian Geographers conference, Pipestem, WV, USA, 2-3 Oct 1981)			
1	NTIS, PC A02/MF A01	DE83001886	MN -13	8:2378
CONF-8110238-	(DOE statistical symposium, Upton, NY, USA, 28-30 Oct 1981)			
1	NTIS, PC A02/MF A01	DE83001893	MN -41	8:3033
CONF-8110239-	(American Fishery Society symposium on acquisition and utilization of aquatic habitat inventory, Portland, OR, USA, 28-30 Oct 1981)			
1	NTIS, PC A02/MF A01	DE83001966	MN -11	8:3014
CONF-811267-	(International energy workshop, Stanford, CA, USA, 10-11 Dec 1981)			
Summ.	NTIS, PC A03/MF A01	DE82021183	MN -13	8:2416
CONF-820106-	(20. aerospace science conference, Orlando, FL, USA, 11-14 Jan 1982)			
	Am. Inst. Aeronaut. Astronaut. Monogr., No. 82-0069, 1-8(Jan 1982)			8:1984
	Am. Inst. Aeronaut. Astronaut. Monogr., No. 82-0237, 1-8(Jan 1982)			8:2926
CONF-820217-	(9. energy technology conference, Washington, DC, USA, 16-18 Feb 1982)			
8	Institute of Gas Technology, 3424 South State St., IIT Center, Chicago, IL 60616		MN -90c	8:1560
CONF-820264-	(AIChE winter meeting, Orlando, FL, USA, 28 Feb-3 Mar 1982)			
1	NTIS, PC A02/MF A01		MN -59b	8:1998
CONF-820265-	(American Psychological Association mid-winter convention, Monterey, CA, USA, 25-27 Feb 1982)			
1	*See* LBL-14846	DE83000494	MN -78	8:2307
CONF-820303-	(Waste management conference, Tucson, AZ, USA, 8-11 Mar 1982)			
41	*See* RHO-SA-255P	DE83000813	MN -70	8:1792
CONF-820391-	(32. conference on nuclear spectroscopy and nuclear structure, Kiev, Ukrainian SSR, 16-18 Mar 1982)			
Summ.	*See* INIS-SU-125	DE83780083	MN -34C	8:3256
CONF-820424-	(ANS topical meeting on treatment and handling of radioactive wastes, Richland, WA, USA, 19-22 Apr 1982)			
37	*See* RFP-3267	DE83000689	MN -15	8:1761
CONF-820453-	(5. technical conference on peat, Bethesda, MD, USA, 27-29 Apr 1982)			
3	NTIS, PC A02/MF A01	DE83900127	MN -90c	8:1512
CONF-820522-	(Electro '82 conference, Boston, MA, USA, 25-27 May 1982)			
2	*See* UCRL-87478	DE83000738	MN -32	8:3895
CONF-820555-	(4. phootovoltaic solar energy conference, Stresa, Italy, 10-14 May 1982)			
5	*See* SERI/TP-211-1609	DE83000307	MN -63	8:1948
CONF-8205116-	(5. international conference on novel results in particle physics, Nashville, TN, USA, 24-26 May 1982)			
5	*See* LA-UR-82-2562	DE83000352	MN -34D	8:3246
6	*See* SLAC-PUB-2943	DE82022223	MN -34D	8:3210
CONF-8205118-	(Workshop on fluctuation and anomalous transport to tokamaks, College Park, MD, USA, 7-8 May 1981)			
	NTIS, PC A03/MF A01	DE83001154	STD -20f	8:3546
CONF-8205121-	(CNLS order in Chaos conference, Los Alamos, NM, USA, 24-28 May 1982)			
5	*See* LA-UR-82-2655	DE83000650	MN -32	8:3888
CONF-8205125-	(American Gas Association distribution conference, Washington, DC, USA, 3-5 May 1982)			
1	NTIS, PC A02/MF A01	DE83900124	MN -92	8:1653
CONF-8205127-	(International symposium on chemistry of the Mediterranean - transport and reactivity of pollutants in the estuary, Primosten, Croatia, Yugoslavia, 6-12 May 1982)			
1	NTIS, PC A03/MF A01	DE83001318	MN -11	8:3019
CONF-820605-	(World hydrogen energy conference, Pasadena, CA, USA, 13-17 Jun 1982)			
20	NTIS, PC A02/MF A01	DE83900088	MN -61c	8:1838
21	NTIS, PC A02/MF A01	DE83000568	MN -98G	8:1846
22	NTIS, PC A02/MF A01	DE83900078	MN -61c	8:1895
CONF-820610-	(American Institute of Chemical Engineers' spring meeting, Anaheim, CA, USA, 8-10 Jun 1982)			
12	NTIS, PC A02/MF A01	DE82022185	MN -90c	8:1513

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CONF-820612-	(Symposium on instrumentation and control for fossil energy processes, Houston, TX, USA, 7-9 Jun 1982)			
11	NTIS, PC A02/MF A01	DE82021132	MN -90b	8:1514
CONF-820626-	(15. power modulator symposium, Baltimore, MD, USA, 14-16 Jun 1982)			
11	*See* BNL-31848	DE83000212	MN -28	8:2798
CONF-820648-	(18. joint propulsion conference, Cleveland, OH, USA, 21-23 Jun 1982)			
	AIAA Pap., No. 82-1276, 1-8(1982)			8:2258
CONF-820655-	(Health Physics Society annual meeting, Las Vegas, NV, USA, 27 Jun-1 Jul 1982)			
10	*See* PNL-SA-10153	DE83002042	MN -80	8:2104
CONF-820675-	(International conference on neutrino physics, Balaton, Hungary, 14-19 Jun 1982)			
4	*See* BNL-31957	DE83001307	MN -34D	8:3188
CONF-820685-	(14. biomass thermochemical conversion contractor's meeting, Arlington, VA, USA, 23-24 Jun 1982)			
3-Rev.1	*See* PNL-SA-9954-Rev.1	DE83002071	MN -61a	8:1935
CONF-8206101-	(Conference on pulsations in classical and cataclysmic variable stars, Boulder, CO, USA, 1 Jun 1982)			
5	*See* LA-UR-82-2348	DE82021776	MN -34B	8:3128
CONF-8206116-	(Workshop on division of particles and fields of the APS, Aspen, CO, USA, 28 Jun-16 Jul 1982)			
2	*See* BNL-31854	DE83000216	MN -34D	8:2862
3	*See* BNL-31853	DE83000214	MN -34D	8:2861
4	*See* BNL-31782	DE83000211	MN -28	8:3211
5	*See* BNL-31997	DE83001303	MN -34D	8:3189
CONF-8206118-	(6. annual international collaboration of advanced neutron sources meeting, Argonne, IL, USA, 28 Jun-2 Jul 1982)			
3	*See* LA-UR-82-2493	DE82021759	MN -34C	8:2846
4	*See* LA-UR-82-2596	DE83000331	MN -34C	8:1832
5	*See* LA-UR-82-2662	DE83000646	MN -34C	8:2847
6	*See* LA-UR-82-2681	DE83000643	MN -37	8:2848
CONF-8206120-	(Elementary particle physics and future facilities summer study, Snowmass, CO, USA, 1 Jun 1982)			
3	*See* BNL-31987	DE83001305	MN -34D	8:3212
4	*See* BNL-31885	DE83000841	MN -34D	8:3187
CONF-8206121-	(CSL conference on obscuration and aerosol research, Aberdeen, MD, USA, 21-25 Jun 1982)			
1	*See* LA-UR-82-2791	DE83000607	MN -34	8:3539
CONF-8206124-	(9. annual conference on plasma physics, Oxford, UK, 30 Jun-2 Jul 1982)			
1	*See* ORNL/TM-8430	DE83000470	STD -20a	8:3732
CONF-820704-	(International topical meeting on LMFBR safety, Lyon, France, 18-23 Jul 1982)			
29	*See* HEDL-SA-2724-FP	DE83000506	MN -79p	8:2288
30	*See* HEDL-SA-2725	DE83000509	MN -79b	8:2289
CONF-820705-	(2. joint ASME/ANS nuclear engineering conference, Portland, OR, USA, 25-28 Jul 1982)			
8	*See* EGG-M-08781	DE83000540	MN -78	8:2270
9	*See* EGG-M-04382	DE83000539	MN -78	8:2235
10	*See* HEDL-SA-2664-FP	DE83000486	MN -79i	8:2247
CONF-820718-	(21. international conference on high energy physics, Paris, France, 29 Jul-8 Aug 1982)			
9	*See* BNL-31856	DE83000209	MN -28	8:2781
11	NTIS, PC A02/MF A01	DE82022254	MN -34D	8:2864
CONF-820724-	(15. annual International Metallographic Society meeting, Orlando, FL, USA, 18-21 Jul 1982)			
6	*See* EGG-M-07182	DE83000538	MN -70	8:1728
CONF-820729-	(Summer computer simulation conference, Denver, CO, USA, 19-21 Jul 1982)			
3	*See* EGG-M-10781	DE83000755	MN -78	8:2112
CONF-820745-	(2. LAMPF workshop, Los Alamos, NM, USA, 19-22 Jul 1982)			
2	*See* DOE/ER/03244-99	DE83001040	MN -34D	8:3222
3	*See* DOE/ER/03244-100	DE83001009	MN -34D	8:3229
CONF-820750-	(American Physical Society summer study on particle physics and future facilities, Snowmass, CO, USA, 1 Jul 1982)			
2	*See* LA-UR-82-2768	DE83000614	MN -34	8:2849
CONF-820752-	(Gamow cosmology summer school, Varenna, Italy, 13-23 Jul 1982)			
1	*See* LBL-14739	DE83001361	MN -34B	8:2921
CONF-820802-	(International meeting on thermal nuclear reactor safety, Chicago, IL, USA, 29 Aug-2 Sep 1982)			
23	NTIS, PC A02/MF A01	DE82022324	MN -80	8:2259
28	*See* EGG-M-03782	DE83000413	MN -78	8:2264
30	*See* EGG-M-17782	DE83000537	MN -78	8:2273
32	*See* EGG-M-04782	DE83000411	MN -78	8:2267
33	*See* EGG-M-03482	DE83000409	MN -78	8:2263
34	*See* EGG-M-15382	DE83000547	MN -78	8:2271
36	NTIS, PC A02/MF A01	DE82022323	MN -80	8:2260
37	*See* SAND-82-2129C	DE83000314	MN -78	8:2322
38	*See* EGG-M-17082	DE83000566	MN -78	8:2272
39	*See* EGG-M-05582	DE83000565	MN -78	8:2111
40	*See* EGG-M-03982	DE83000564	MN -78	8:2102

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41	See EGG-M-04082	DE83000545	MN -78	8:2265
42	See EGG-M-04182	DE83000548	MN -78	8:2266
CONF-820806-	(40. Electron Microscopy Society of America annual meeting, Washington, DC, USA, 9-13 Aug 1982)			
4	See PNL-SA-10300	DE83002014	MN -20c	8:3830
CONF-820810-	(10. international mathematics and computers simulation congress on systems simulation and scientific computation, Montreal, Canada, 9-13 Aug 1982)			
14	See PNL-SA-10295	DE83002015	MN -70	8:1756
CONF-820814-	(17. Intersociety Energy Conversion Engineering conference, Los Angeles, CA, USA, 8-13 Aug 1982)			
31	NTIS, PC A02/MF A01	DE82021066	MN -90	8:1515
34	NTIS, PC A02/MF A01	DE83000562	MN -95f	8:2496
35	See PNL-SA-10076	DE83002017	MN -94e	8:2347
CONF-820815-	(2. ASME international computer engineering conference, San Diego, CA, USA, 15-19 Aug 1982)			
2	See EGG-M-07082	DE83000756	MN -80	8:2236
CONF-820820-	(Review of progress in quantitative NDE, San Diego, CA, USA, 1-6 Aug 1982)			
7	See UCRL-88293	DE83000836	MN -38	8:2753
8	See PNL-SA-10446	DE83002036	MN -13	8:2752
CONF-820822-	(26. technical symposium and exhibition of the International Society for Optical Engineering, San Diego, CA, USA, 21-27 Aug 1982)			
14	See SAND-82-1491C	DE83001274	MN -37	8:2933
CONF-820827-	(Energy storage contractors review meeting, Arlington, VA, USA, 23-26 Aug 1982)			
25	See PNL-SA-10636	DE83002003	MN -94e	8:2358
26	See PNL-SA-10593	DE83002041	MN -94e	8:2350
28	See PNL-SA-10591	DE83002059	MN -94e	8:2349
CONF-820828-	(9. EPS Nuclear Physics Divisional conference on nuclear structure, Amsterdam, Netherlands, 29 Aug-4 Sep 1982)			
6	See LBL-14824	DE83000498	MN -34C	8:3502
CONF-820833-	(17. DOE nuclear air cleaning conference, Denver, CO, USA, 1 Aug-6 Sep 1982)			
14	See UCRL-87535	DE83001616	MN -11	8:2986
15	See PNL-SA-10290	DE83002072	MN -70	8:1755
16	See EGG-M-06882	DE83000559	MN -20e	8:3764
CONF-820839-	(International conference on X-ray and VUV synchrotron radiation instrumentation, Hamburg, F.R. Germany, 9-13 Aug 1982)			
3	See BNL-31874	DE83000215	MN -28	8:2799
CONF-820849-	(Summer study in energy efficient buildings, Santa Cruz, CA, USA, 22-28 Aug 1982)			
10	See PNL-SA-10644	DE83002008	MN -95d	8:2472
11	See PNL-SA-10584	DE83002002	MN -95d	8:2471
CONF-820854-	(4. annual DOE LLWMP participant's information meeting, Denver, CO, USA, 31 Aug-2 Sep 1982)			
13	See EGG-M-18282	DE83000158	MN -70B	8:1729
14	See EGG-M-19282	DE83000041	MN -70B	8:1731
15	See EGG-M-20282	DE83000040	MN -70B	8:1733
16	See EGG-M-18982	DE83000042	MN -70B	8:1730
17	See BNL-31887	DE83000713	MN -70B	8:1720
18	See PNL-SA-10700	DE83002038	MN -70B	8:1757
19	See PNL-SA-10701	DE83002044	MN -70B	8:1758
CONF-820855-	(International conference on X-ray and atomic inner-shell physics, Eugene, OR, USA, 23-27 Aug 1982)			
4	See LBL-14857	DE83000515	MN -28	8:3176
5	See SAND-82-2299C	DE83001285	MN -34A	8:3179
CONF-820858-	(Technical Association of Pulp and Paper Industries conference, Asheville, NC, USA, 30 Aug-1 Sep 1982)			
2	NTIS, PC A02/MF A01	DE82022327	MN -48	8:3053
CONF-820861-	(31. annual Denver X-ray conference, Denver, CO, USA, 3-5 Aug 1982)			
2	EG and G ORTEC, 100 Midland Rd. Oak Ridge, TN 37830		MN -90a	8:1563
CONF-820873-	(IAEA IWGGCR specialists' meeting on gas-cooled reactor seismic design problems and solutions, San Diego, CA, USA, 30 Aug-1 Sep 1982)			
1	See GA-A-16868	DE82021380	MN -77	8:2283
2	See GA-A-16869	DE82021383	MN -77	8:2284
CONF-820875-	(12. international conference on defects in semiconductors, Amsterdam, Netherlands, 31 Aug-3 Sep 1982)			
1	See LBL-14227	DE83000514	MN -34	8:2653
CONF-820877-	(American Institute of Chemical Engineers summer meeting, Cleveland, OH, USA, 29 Aug-1 Sep 1982)			
1	NTIS, PC A02/MF A01	DE82022318	MN -95e	8:2517
CONF-820878-	(Institute of mathematics and statistics annual meeting, Cincinnati, OH, USA, 16-19 Aug 1982)			
1	See EGG-M-11682	DE83000563	MN -80	8:2219
3	See BNL-31947	DE83001572	MN -28	8:2800
CONF-820881-	(ASCE hydraulics speciality conference, Jackson, MS, USA, 17-20 Aug 1982)			
1	See PNL-SA-10423	DE83002029	MN -11	8:3021

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CONF-820884-	(International Astronomical Union symposium on supernova remnants and their X-ray emission, Venice, Italy, 29 Aug-2 Sep 1982)			
1	*See* LA-UR-82-2989	DE83002080	MN -34B	8:3130
2	*See* LA-UR-82-2844	DE83001941	MN -34D	8:3129
CONF-820886-	(15. aerosol technology meeting, Berkeley, CA, USA, 23-25 Aug 1982)			
1	*See* PNL-SA-10548-S	DE83001950	MN -86	8:1791
CONF-820888-	(Methods for comparing precipitation chemistry data workshop, Rensselaerville, NY, USA, 10-12 Aug 1982)			
1	*See* BNL-31840	DE83000210	MN -11	8:2949
CONF-820890-	(54. National Technical Association annual convention, Baltimore, MD, USA, 2-7 Aug 1982)			
2	*See* EGG-M-07582	DE83000561	MN -32	8:3874
CONF-820901-	(7. international heat transfer conference, Munich, F.R. Germany, 6-10 Sep 1982)			
5	*See* EGG-M-08581	DE83000588	MN -78	8:2269
6	*See* EGG-M-9181	DE83000589	MN -78	8:2262
CONF-820906-	(16. IEEE photovoltaics specialists conference, San Diego, CA, USA, 28-30 Sep 1982)			
4	*See* SAND-82-2119C	DE82022163	MN -63d	8:1980
5	*See* SERI/TP-212-1738	DE83000121	MN -63b	8:1954
6	*See* DOE/ET/20279-228	DE83001137	MN -63a	8:1899
7	*See* DOE/ET/20279-229	DE83001138	MN -63d	8:1900
8	*See* SAND-82-2220C	DE83001033	MN -63a	8:1885
9	*See* SAND-82-2219C	DE83001032	MN -63d	8:1884
10	*See* DOE/ET/20279-227	DE83001136	MN -63d	8:1898
11	*See* DOE/ET/20279-226	DE83001135	MN -63d	8:1974
12	*See* DOE/ET/20279-230	DE83001139	MN -63d	8:2042
13	*See* SAND-82-0539C	DE83000079	MN -63b	8:1939
15	*See* SERI/TP-211-1716	DE83001232	MN -63e	8:1949
16	*See* SAND-82-2217C	DE83000325	MN -63d	8:1982
17	*See* SERI/TP-254-1739	DE83001712	MN -63d	8:1983
18	*See* SAND-82-2218C	DE83000321	MN -63c	8:1945
19	*See* SAND-82-2162C	DE83000318	MN -63c	8:1944
20	*See* SAND-82-0514C	DE83000049	MN -63c	8:1938
21	*See* SAND-82-2135C	DE83001273	MN -63	8:1981
22	*See* SERI/TP-211-1747	DE83002093	MN -63	8:1951
23	*See* SERI/TP-212-1749	DE83002095	MN -63	8:1955
24	*See* SERI/TP-211-1731	DE83002092	MN -63	8:1950
26	*See* SAND-82-0540C	DE83000319	MN -63d	8:1979
27	*See* SERI/TP-212-1718	DE83001728	MN -63	8:1953
28	*See* SERI/TP-211-1757	DE83001727	MN -63	8:1952
CONF-820914-	(International conference on nuclear power experience, Vienna, Austria, 13-17 Sep 1982)			
4	*See* HEDL-SA-2694		MN -79	8:2248
CONF-820915-	(BNES international conference on gas cooled reactors today, Bristol, UK, 20-24 Sep 1982)			
5	NTIS, PC A02/MF A01	DE82022328	MN -77	8:2134
CONF-820919-	(ANS workshop on LLW packaging and shipping, San Diego, CA, USA, 12-16 Sep 1982)			
2	*See* SAND-82-1417	DE82022167	MN -71	8:1713
3	*See* EGG-M-19482	DE83001352	MN -70B	8:1732
CONF-820927-	(57. AIME Society of Petroleum Engineers annual technical conference and exhibition, New Orleans, LA, USA, 26-29 Sep 1982)			
7	*See* LBL-14118	DE83000499	MN -92a	8:1639
CONF-820929-	(IUPAP international conference on magnetism, Kyoto, Japan, 6-10 Sep 1982)			
7	*See* LBL-14845	DE83000513	MN -34	8:2585
8	*See* LA-UR-82-2627	DE83000670	MN -34	8:2580
CONF-820930-	(9. international conference on plasma physics and controlled nulcear fusion research, Baltimore, MD, USA, 1-8 Sep 1982)			
18	*See* IAEA-CN-41/Q-3	DE82022298	MN -20d	8:3776
19	*See* KMSF-U-1213	DE83001385	MN -21	8:3820
CONF-820940-	(Passive and hybrid solar energy update conference, Washington, DC, USA, 15-17 Sep 1982)			
3	*See* SERI/TP-254-1711	DE83000120	MN -59a	8:1878
4	*See* LBL-14913	DE83001553	MN -59	8:1877
6	*See* DOE/CE/30742-1	DE83001797	MN -59a	8:1999
CONF-820942-	(Nuclear data for science and technology international conference, Antwerp, Belgium, 6-10 Sep 1982)			
10	*See* LA-UR-82-2643	DE83000662	MN -34C	8:3418
11	*See* HEDL-SA-2703FP	DE83000508	MN -34C	8:3350
12	*See* EGG-M-05982	DE83000590	MN -34C	8:3410
14	*See* HEDL-SA-2704-FP	DE83000507	MN -34C	8:3351
15	*See* BNL-NCS-31877	DE83000711	MN -34C	8:3325
16	NTIS, PC A02/MF A01	DE82022301	MN -79d	8:2150
17	NTIS, PC A02/MF A01	DE82022329	MN -34C	8:2216
18	NTIS, PC A02/MF A01	DE82022333	MN -34C	8:3250
19	*See* LA-UR-82-2644	DE83000663	MN -34C	8:3278
20	*See* LA-UR-82-3018	DE83001975	MN -34C	8:1833
CONF-820943-	(ANS topical meeting - spent fuel storage, Savannah, GA, USA, 26-29 Sep 1982)			
4	*See* PNL-SA-10341	DE83002007	MN -78	8:2105

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CONF-820944-	(Workshop on diagnostics for fusion reactor conditions, Varenna, Italy, 6-17 Sep 1982)			
2-Rev.1	*See* UCRL-87675-Rev.1	DE83000778	MN -20	8:3741
CONF-820945-	(International conference on ion beam modification of materials, Grenoble, France, 6-10 Sep 1982)			
5Draft	NTIS, PC A02/MF A01	DE82022319	MN -34A	8:2637
CONF-820948-	(12. symposium on fusion technology, Juelich, F.R. Germany, 13-17 Sep 1982)			
4	*See* LA-UR-82-2650	DE83000667	MN -20c	8:3823
CONF-820950-	(Conference on the neutron and its applications, Cambridge, UK, 13-17 Sep 1982)			
4	*See* BNL-31916	DE83001302	MN -34C	8:3183
CONF-820956-	(13. general meeting of the International Mineralogical Association, Varna, Bulgaria, 19-25 Sep 1982)			
1	*See* SAND-82-1959C	DE82020984	MN -70	8:2660
CONF-820957-	(International conference EXAFS and near edge structures, Frascati, Italy, 13-17 Sep 1982)			
2	*See* BNL-31863	DE83000243	MN -4	8:2552
CONF-820960-	(International symposium on GaAs and related compounds, Albuquerque, NM, USA, 20-22 Sep 1982)			
1	*See* SAND-82-1323C	DE82022164	MN -37	8:2760
2	*See* SAND-82-1367C	DE83000080	MN -34	8:2659
3	*See* SAND-82-1296C	DE82022194	MN -34A	8:2657
4	*See* SAND-82-1297C	DE83000316	MN -25	8:2658
CONF-820961-	(Colloquium on polycrystalline semiconductors, Perpignan, France, 2-4 Sep 1982)			
1	*See* SAND-82-1031C	DE82022168	MN -63b	8:1941
CONF-820962-	(NRC/ANS meeting on basic thermal hydraulic mechanisms in LWR analysis, Bethesda, MD, USA, 14-15 Sep 1982)			
3	*See* SAND-82-1325C	DE82022171	MN -78	8:2318
CONF-820963-	(5. coordinated research meeting on measurement and evaluation of transactinium isotope nuclear data, Geel, Belgium, 1-3 Sep 1982)			
1	*See* EGG-M-17982	DE83000591	MN -34C	8:3411
CONF-820964-	(Joint Pacific Northwest American Geophysical Union and American Association for the Advancement of Science meeting, Fairbanks, AK, USA, 14-18 Sep 1982)			
2	*See* RHO-BW-SA-220P	DE83000718	MN -70	8:1762
CONF-820965-	(IUTAM symposium on metallurgical applications of MHD, Cambridge, UK, 6-10 Sep 1982)			
1	*See* SAND-82-0364C	DE83000083	MN -38	8:2590
CONF-820967-	(International topical meeting on irradiation technology, Grenoble, France, 28 Sep-1 Oct 1982)			
1	*See* EGG-M-06682	DE83000685	MN -78	8:2268
2	*See* EGG-M-06582	DE83000684	MN -78	8:2244
CONF-820969-	(AIAA/EPRI international conference on UPH and compressed air energy storage, San Francisco, CA, USA, 21-22 Sep 1982)			
1	*See* PNL-SA-10531	DE83002058	MN -94e	8:2357
2	*See* PNL-SA-10166	DE83002057	MN -94e	8:2348
CONF-820970-	(CO/sub 2/ research conference, Berkeley Springs, WV, USA, 19-23 Sep 1982)			
1	*See* UCRL-88109	DE83002161	MN -11	8:2956
CONF-820974-	(1. IEEE Computer Society international conference on medical computer science computational medicine, Philadelphia, PA, USA, 23-25 Sep 1982)			
1	*See* BNL-31849	DE83000213	MN -48	8:3043
CONF-820976-	(National Science Foundation workshop in compact fusion reactors, Washington, DC, USA, 30 Sep-1 Oct 1982)			
1	*See* LA-UR-82-2994	DE83002076	MN -20d	8:3824
CONF-821005-	(DOE international decommissioning symposium, Seattle, WA, USA, 10-14 Oct 1982)			
12	*See* PNL-SA-10369	DE83002052	MN -80	8:2174
14	*See* PNL-SA-10370	DE83002050	MN -80	8:2175
15	*See* PNL-SA-10372	DE83002023	MN -70A	8:1712
16	*See* PNL-SA-10371	DE83002070	MN -78	8:2176
CONF-821011-	(IEEE nuclear science symposium, Washington, DC, USA, 20-22 Oct 1982)			
2	NTIS, PC A02/MF A01	DE83001184	MN -37	8:2865
3	*See* LA-UR-82-2975	DE83002073	MN -15	8:1818
4	*See* LA-UR-82-2980	DE83002084	MN -37	8:2903
5	*See* LA-UR-82-2981	DE83002083	MN -37	8:2904
7	*See* LA-UR-82-3014	DE83001976	MN -15	8:1819
8	*See* LA-UR-82-2973	DE83002060	MN -15	8:1817
9	*See* UCRL-87786	DE83001178	MN -70	8:1827
10	*See* UCRL-87604	DE83001180	MN -21	8:3839
11	*See* UCRL-87808	DE83001540	MN -70	8:1773
12	*See* UCRL-87588	DE83001620	MN -37	8:2913
CONF-821015-	(Electrochemical Society fall meeting, Detroit, MI, USA, 17-22 Oct 1982)			
2	*See* DOE/NASA/12726-17	DE83000791	STD -94c	8:2447
CONF-821016-	(9. symposium on engineering problems of fusion research, Chicago, IL, USA, 26-29 Oct 1982)			
3	NTIS, PC A02/MF A01	DE83001884	MN -20a	8:3759

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CONF-821018-	(IEEE/ASME/ASCE joint power generation conference, Denver, CO, USA, 17-21 Oct 1982)			
3	*See* GA-A-16792	DE83000311	MN -77	8:2136
4	*See* DOE/NASA/13111-11	DE83001399	STD -90f	8:1625
7	*See* UNI-SA-104	DE82022159	MN -80	8:2212
8	*See* DOE/NASA/13111-12	DE83001100	STD -90f	8:1626
CONF-821021-	(DOE statistical symposium, Idaho Falls, ID, USA, 1 Oct 1982)			
2	*See* SAND-82-2202C	DE83001034	MN -80	8:2327
CONF-821026-	(2. international workshop on the impact of hydrogen on water reactor safety, Albuquerque, NM, USA, 3-7 Oct 1982)			
6	*See* SAND-82-2161C	DE83000077	MN -78	8:2323
7	*See* SAND-82-2078C	DE83000312	MN -78	8:2320
8	*See* SAND-82-1969C	DE83000315	MN -78	8:2319
CONF-821029-	(IEEE Computer Society international symposium on medical imaging and image interpretation, Berlin, F.R. Germany, 26-28 Oct 1982)			
3	*See* LBL-14114	DE83000496	MN -38	8:2905
CONF-821031-	(IEEE Profesional Communication Society conference, Lynnfield-Wakefield, MA, USA, 13-25 Oct 1982)			
1	*See* UCRL-88112	DE82021349	MN -38	8:3871
2	NTIS, PC A02/MF A01	DE83001965	MN -13	8:3866
CONF-821033-	(Instrumentation Society of American international conference, Philadelphia, PA, USA, 18-21 Oct 1982)			
1	*See* BNL-31828	DE83000267	MN -95d	8:2453
CONF-821035-	(Combustion Insitute symposium on western states section, Livermore, CA, USA, 11-12 Oct 1982)			
3	*See* SAND-82-8776	DE83002213	MN -4	8:1848
4	*See* UCRL-88180	DE83000695	MN -4	8:2704
CONF-821037-	(10. water reactor safety research information conference, Gaithersburg, MD, USA, 12-15 Oct 1982)			
1	*See* SAND-82-2120C	DE82022196	MN -78	8:2321
2-Summ.	*See* SAND-82-2181C	DE83000278	MN -80	8:2324
5	*See* LA-UR-82-2806	DE83000610	MN -78	8:2305
6	*See* LA-UR-82-2805	DE83000609	MN -78	8:2304
7	NTIS, PC A02/MF A01	DE83001926	MN -78	8:2261
8 .	*See* SAND-82-2182C	DE83001183	MN -78	8:2325
9	*See* SAND-82-2285C	DE83001168	MN -78	8:2329
10	*See* SAND-82-2269C	DE83001169	MN -78	8:2328
11	*See* LA-UR-82-2931	DE83002063	MN -41	8:2306
12	*See* SAND-82-2183C	DE83001172	MN -79p	8:2326
CONF-821040-	(53. shock and vibration symposium, Danvers, MD, USA, 26-28 Oct 1982)			
1	*See* SAND-82-1284C	DE82022170	MN -37	8:2718
CONF-821043-	(Tri-service symposium on gun tube wear and erosion, Dover, NJ, USA, 25-28 Oct 1982)			
1	*See* UCRL-87686	DE83000597	MN -25	8:2592
CONF-821046-	(11. world conference of the International Nuclear Target Development Society, Seattle, WA, USA, 6-8 Oct 1982)			
1	NTIS, PC A02/MF A01	DE83001930	MN -37	8:2866
3	*See* UCRL-88197	DE83000750	MN -28	8:2851
CONF-821049-	(TMS/AIME fall meeting, St. Louis, MO, USA, 24-28 Oct 1982)			
2	NTIS, PC A02/MF A01	DE83001898	MN -20c	8:2634
CONF-821050-	(Cyclotron facility workshop, Bloomington, IN, USA, 27-31 Oct 1982)			
1	*See* LA-UR-82-3076	DE83001988	MN -34C	8:3279
CONF-821051-	(International conference on fundamentals of thermochemical biomass conversion, East Park, CO, USA, 18-22 Oct 1982)			
1	*See* PNL-SA-10350	DE83002033	MN -61a	8:1936
CONF-821053-	(Workshop on standardization of methods for measuring migration of radionuclides in geomedia, Berlin, F.R. Germany, 25-29 Oct 1982)			
1	*See* RHO-BW-SA-276P	DE83002108	MN -11	8:1766
CONF-821054-	(4. symposium on climate processes: sensitivity to solar irradiance and CO/sub 2/, Palisades, NY, USA, 25-27 Oct 1982)			
1	NTIS, PC A02/MF A01	DE83001897	MN -34B	8:2950
CONF-821055-	(20. automotive technology development contractor coordination meeting, Dearborn, MI, USA, 25-28 Oct 1982)			
1	NTIS, PC A03/MF A01	DE83002134	MN -95d	8:2457
CONF-821056-	(US/UK exchange meeting on solvent extraction technology, Oak Ridge, TN, USA, 25-28 Oct 1982)			
7	NTIS, PC A02/MF A01	DE83001903	MN -86	8:1702
8	NTIS, PC A03/MF A01	DE83001882	MN -86	8:1703
9	NTIS, PC A02/MF A01	DE83001920	MN -86	8:1704
CONF-821058-	(Estonian Academy of Sciences conference, Liningrad, USSR, 9-22 Oct 1982)			
1	NTIS, PC A02/MF A01	DE83001967	MN -11	8:3087
CONF-821059-	(US/Japan workshop on compact toroids, Osaka, Japan, 19-22 Oct 1982)			
1	*See* LA-UR-82-2892	DE83002067	MN -20f	8:3729
CONF-821060-	(International symposium on conversion to solid fuels, Newport Beach, CA, USA, 26-28 Oct 1982)			
1	NTIS, PC A02/MF A01	DE83001964	MN -95f	8:2497

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CONF-821062-	(AIAA/SPIE/OSA technology for space astrophysics conference, Danbury, CT, USA, 4 Oct 1982)			
1	*See* UCRL-87682	DE83001177	MN -38	8:2721
CONF-821066-	(Symposium for Northeastern, Seattle, WA, USA, 6-8 Oct 1982)			
2	NTIS, PC A02/MF A01	DE83001957	MN -28	8:2802
CONF-821071-	(70. annual national safety congress and exposition, Chicago, IL, USA, 19 Oct 1982)			
1	*See* UCRL-88242	DE83001176	MN -41	8:3105
CONF-821101-	(ASME winter annual meeting, Pheonix, AZ, USA, 14-19 Nov 1982)			
3	*See* LA-UR-82-1021	DE82014080	MN -38	8:2579
11	*See* SERI/TP-252-1596	DE83000450	MN -64	8:1991
CONF-821103-	(American Nuclear Society winter meeting, Washington, DC, USA, 14-19 Nov 1982)			
23	*See* SAND-82-1839C	DE83000084	MN -70	8:1771
24	*See* DOE/ER/53140-3	DE83001648	MN -20g	8:3550
28	*See* DP-MS-82-39	DE83000626	MN -83	8:1695
CONF-821105-	(Asilomar conference, Pacific Grove, CA, USA, 8-10 Nov 1982)			
1	*See* LA-UR-82-1504	DE82015732	MN -21	8:3822
CONF-821106-	(Annual meeting of heat transfer and energy conversion, Los Angeles, CA, USA, 14-18 Nov 1982)			
8	*See* MLM-2997-OP	DE82021323	MN -70	8:1743
CONF-821108-	(Applied superconductivity conference, Knoxville, TN, USA, 30 Nov-3 Dec 1982)			
2	*See* LA-UR-82-2720	DE83000641	MN -20b	8:2715
3	*See* LA-UR-82-2719	DE83000640	MN -94b	8:2089
4	*See* BNL-31396	DE83000717	MN -28	8:2797
5	*See* BNL-31394	DE83000716	MN -28	8:2852
CONF-821111-	(29. national symposium on American Vacuum Society, Baltimore, MD, USA, 16-19 Nov 1982)			
4	*See* MLM-2996-OP	DE82021312	MN -34	8:2627
5	*See* MLM-2995-OP	DE82021313	MN -70	8:1826
7	*See* SAND-82-2016C	DE82022191	MN -20f	8:3738
CONF-821119-	(International symposium on recent advances in nuclear materials safeguards, Nienna, Australia, 8-12 Nov 1982)			
1	*See* LA-UR-82-2754	DE83000613	MN -10	8:1814
6	*See* LA-UR-82-2753	DE83000635	MN -15	8:1813
7	*See* LA-UR-82-2781	DE83000606	MN -15	8:1815
9	*See* LA-UR-82-2807	DE83000611	MN -15	8:1816
CONF-821122-	(Conference on glass and ceramic materials, Oak Ridge, TN, USA, 8-12 Nov 1982)			
1	*See* MLM-3017(OP)	DE83001537	MN -70B	8:1744
CONF-821123-	(Conference on application of accelerator in research and industry, Denton, TX, USA, 10 Nov 1982)			
1	*See* UCRL-88312	DE83002150	MN -28	8:2780
2	*See* SAND-82-1698C	DE83001269	MN -28	8:3178
CONF-821124-	(5. symposium on physics and technology of compact toroids in the magnetic fusion energy program, Belevue, WA, USA, 16-18 Nov 1982)			
1	*See* LA-UR-82-2990	DE83002079	MN -20g	8:3730
2	*See* LA-UR-82-2991	DE83002078	MN -20g	8:3731
CONF-821201-	(Fall DECUS US Symposium, Anaheim, CA, USA, 6-10 Dec 1982)			
1	*See* EGG-1183-6003	DE82017069	MN -32	8:3873
CONF-821202-	(13. Computer Measurement Group conference, San Diego, CA, USA, 14-17 Dec 1982)			
1	*See* LA-UR-82-1572	DE82018367	MN -32	8:3886
2	*See* LA-UR-82-1819	DE82017328	MN -32	8:3887
CONF-821203-	(International conference on lasers, New Orleans, LA, USA, 13-17 Dec 1982)			
1	*See* LBL-14635	DE82018730	MN -28	8:2796
CONF-821205-	(NWTS information meeting on basalt waste isolation project, Las Vegas, NV, USA, 14-16 Dec 1982)			
2	*See* UCRL-88174	DE83000744	MN -70	8:1714
3	*See* SAND-82-2192C	DE83000323	MN -70	8:1772
9	*See* RHO-BW-SA-250-P	DE83001754	MN -70	8:1765
21	*See* RHO-BW-SA-248-P	DE83001753	MN -70	8:1764
22	*See* RHO-BW-SA-243-P	DE83001484	MN -70	8:1763
CONF-821207-	(IEEE international electron devices meeting, San Francisco, CA, USA, 13-15 Dec 1982)			
2	*See* LA-UR-82-2726	DE83000632	MN -28	8:2759
CONF-821208-	(Optical Society of America workshop on optical fabrication and testing, Palo Alto, CA, USA, 13-15 Dec 1982)			
5	*See* UCRL-88269	DE83001187	MN -38	8:2722
CONF-830304-	(American Nuclear Society topical conference on computational methods, Salt Lake City, UT, USA, 28-31 Mar 1983)			
1	*See* LA-UR-82-2688	DE83000644	MN -32	8:3521
CONF-830305-	(SPE symposium on low permeability, Denver, CO, USA, 14-16 Mar 1983)			
1-Abst.	*See* SAND-82-2243C	DE83000277	MN -92a	8:1667
COO-				
1713-110	*See* DOE/ER/01713-110	DE83000992	MN -4	8:2702
2529-21	*See* DOE/EV/12529-21	DE83001414	MN -11	8:3026

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2567-8	*See* DOE/ER/02567-8	DE83000290	MN -34A	8:3154
3244-99	*See* DOE/ER/03244-99	DE83001040	MN -34D	8:3222
3244-100	*See* DOE/ER/03244-100	DE83001009	MN -34D	8:3229
3435-35	*See* DOE/ER/03435-1	DE83000232	MN -4	8:2694
4041-13	*See* DOE/ET/20310-13	DE83001011	MN -64	8:1990
4991-4	*See* DOE/ER/04991-4	DE83000995	MN -4	8:2681
5075-14	*See* DOE/ER/05075-14	DE83001210	MN -13	8:3898
CW-WR-76-020.100A	NTIS, PC A03/MF A01	DE82022201	STD -90e	8:2056
DELNV-TR-0024	*See* AD-A-112122/7			8:2726
DEMO-81/ 5G	NTIS (US Sales Only), PC A03/MF A01; Also available from Library, Democritus NRC	DE82702539	MN -51	8:1679
DESY-81-047	NTIS (US Sales Only), MF A01	DE82750206	MN -28	8:2853
81-049	NTIS (US Sales Only), MF A01	DE82750226	MN -34D	8:3231
81-050	NTIS (US Sales Only), MF A01	DE82750221	MN -34D	8:3215
81-051	NTIS (US Sales Only), MF A01	DE82750217	MN -34D	8:3194
81-052	NTIS (US Sales Only), MF A01	DE82750227	MN -34D	8:3232
81-054	NTIS (US Sales Only), MF A01	DE82750218	MN -34D	8:3195
81-057	NTIS (US Sales Only), MF A01	DE82750230	MN -34A	8:3530
81-058	NTIS (US Sales Only), MF A01	DE82750219	MN -34D	8:3196
81-059	NTIS (US Sales Only), MF A01	DE82750224	MN -34D	8:3216
81-060	NTIS (US Sales Only), MF A01	DE82750222	MN -34D	8:3217
81-061	NTIS (US Sales Only), MF A01	DE82750228	MN -34D	8:3233
81-062	NTIS (US Sales Only), MF A01	DE82750223	MN -34D	8:3218
81-079	NTIS (US Sales Only), MF A01	DE82750649	MN -34D	8:3234
81-085	NTIS (US Sales Only), PC A02/MF A01	DE82750578	MN -34D	8:3219
81-086	NTIS (US Sales Only), PC A06/MF A01	DE82750579	MN -34D	8:3197
81-089	NTIS (US Sales Only), PC A02/MF A01	DE82750577	MN -34D	8:3220
82-001	NTIS (US Sales Only), PC A03/MF A01	DE82750576	MN -34D	8:3235
DFVLR-FB-81-32	NTIS (US Sales Only), PC A05/MF A01	DE82750541	MN -94a	8:2355
DOE/BC/10033-4	NTIS, PC A03/MF A01	DE83001335	STD -92a	8:1635
DOE/BP-140	NTIS, PC A05/MF A01	DE83001522	MN -95d	8:2458
141	NTIS, PC A04/MF A01	DE83001523	MN -95d	8:2459
DOE/CE-0035	NTIS, PC A09/MF A01	DE83000943	MN -95	8:2460
DOE/CE/30742-1	NTIS, PC A02/MF A01	DE83001797	MN -59a	8:1999
2	NTIS, PC A02/MF A01	DE83001796	MN -59a	8:2000
DOE/CH/10122-4	NTIS, PC A04/MF A01	DE82021290	MN -13	8:1887
5	NTIS, PC A03/MF A01	DE83001148	MN -13	8:1888
6	NTIS, PC A03/MF A01	DE83001115	MN -59c	8:2001
6	NTIS, PC A03/MF A01	DE83001146	MN -13	8:2002
DOE/CS/20291-3	NTIS, PC A04/MF A01	DE83001576	STD -95e	8:1897
DOE/CS/30208-T1	NTIS MF A01	DE82022189	MN -95d	8:2461
DOE/CS/30533-1	NTIS, PC A05/MF A01	DE83001015	MN -59c	8:2003
DOE/CS/30661-T1	NTIS MF A01	DE82021281	MN -58b	8:2004
DOE/CS/40090-T1	NTIS, PC A05/MF A01	DE83000103	STD -95f	8:2498
DOE/CS/40327-T2-Vol.1	NTIS, PC A11/MF A01	DE82018807	STD -95f	8:2499
T2-Vol.2	NTIS, PC A12/MF A01	DE82019844	MN -95f	8:2500
DOE/CS/40338-2	NTIS, PC A04/MF A01	DE83001482	STD -92b	8:1648
DOE/CS/50152-1	NTIS, PC A07/MF A01	DE83000964	MN -96	8:2480
DOE/CS/50296-1	NTIS, PC A04/MF A01	DE83001575	STD -95e	8:2518
5	NTIS, PC A06/MF A01	DE83001744	STD -95e	8:2519
DOE/CS/65004-T1	NTIS, PC A04/MF A01	DE83000153	MN -13	8:2369
DOE/CS/90024-1	NTIS, PC A04/MF A01	DE83001016	MN -95f	8:2501
DOE/DP/40124-T1	NTIS, PC A02/MF A01	DE83000014	MN -21	8:3760
DOE/DP/40148-1	NTIS, PC A18/MF A01	DE82021322	MN -38	8:3761
DOE/DP/40160-1	NTIS, PC A02/MF A01	DE83002109	MN -21	8:3762
DOE/DP/40161-1	NTIS, PC A08/MF A01	DE83001829	MN -21	8:3763
DOE/EA-0155	NTIS, PC A12/MF A01	DE83001211	STD -11	8:3038
DOE/EIA-0343	NTIS, PC A09/MF A01	DE83000883	STD -98E	8:2424

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0362	NTIS, PC A04/MF A01	DE83001524	STD -13	8:1715
DOE/EIA/10295-T1	NTIS, PC A06/MF A01	DE83000155	MN -98A	8:1602
DOE/EP-0065-Vol.3F	NTIS, PC A04/MF A01	DE83001104	MN -11	8:2994
0067	NTIS, PC A02/MF A01	DE83001437	MN -92a	8:1660
DOE/ER-0147	NTIS, PC A04/MF A01	DE83001332	MN -48	8:3054
0148	NTIS, PC A05/MF A01	DE83001803	STD -20	8:3543
DOE/ER/01023-5	NTIS, PC A02/MF A01	DE83000294	MN -22	8:2556
DOE/ER/01198-1390	NTIS, PC A06/MF A01	DE83001128	MN -34	8:2638
1392	NTIS, PC A07/MF A01	DE83001041	MN -90a	8:1564
DOE/ER/01545-T1-Pt.1	NTIS, PC A05/MF A01	DE83001126	MN -34D	8:3198
T1-Pt.2	NTIS, PC A02/MF A01	DE83001375	MN -34D	8:3221
DOE/ER/01713-110	NTIS, PC A02/MF A01	DE83000992	MN -4	8:2702
DOE/ER/02026-42	NTIS, PC A02/MF A01	DE83001646	MN -4	8:2691
DOE/ER/02567-8	NTIS, PC A02/MF A01	DE83000290	MN -34A	8:3154
DOE/ER/02706-8	NTIS, PC A03/MF A01	DE83001013	MN -34C	8:3251
DOE/ER/02753-179	NTIS, PC A02/MF A01	DE83000226	MN -34A	8:3155
DOE/ER/03244-99	NTIS, PC A02/MF A01	DE83001040	MN -34D	8:3222
100	NTIS, PC A02/MF A01	DE83001009	MN -34D	8:3229
DOE/ER/03420-9	NTIS, PC A02/MF A01	DE83001133	MN -25	8:2620
DOE/ER/03435-1	NTIS, PC A03/MF A01	DE83000232	MN -4	8:2694
DOE/ER/03612-15	NTIS, PC A02/MF A01	DE83001653	MN -25	8:2557
DOE/ER/03924-T1	NTIS, PC A07/MF A01	DE83000707	MN -34C	8:3252
DOE/ER/04043-42	NTIS, PC A03/MF A01	DE83000112	MN -34D	8:3261
DOE/ER/04311-T1	NTIS, PC A02/MF A01	DE82021853	MN -25	8:2558
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DOE/ER/04987-3	NTIS, PC A02/MF A01	DE83001368	MN -4	8:2680
DOE/ER/04991-4	NTIS, PC A05/MF A01	DE83000995	MN -4	8:2681
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DOE/ER/05096-10	NTIS, PC A04/MF A01	DE83001019	MN -34D	8:3199
DOE/ER/05126-158	NTIS, PC A05/MF A01	DE83000808	MN -34C	8:3425
DOE/ER/05462-T1	NTIS, PC A02/MF A01	DE83001652	MN -4	8:2686
DOE/ER/06039-T1	NTIS, PC A02/MF A01	DE83001549	MN -25	8:2559
DOE/ER/10376-T2	NTIS, PC A03/MF A01	DE83000669	MN -34A	8:3547
DOE/ER/10382-3	NTIS, PC A03/MF A01	DE82018278	MN -34A	8:2560
DOE/ER/10402-2	NTIS, PC A02/MF A01	DE83000724	MN -34D	8:3200
DOE/ER/10661-T1	NTIS, PC A02/MF A01	DE83001548	MN -4	8:2687
DOE/ER/10740-4	NTIS, PC A02/MF A01	DE83000242	MN -25	8:2561
DOE/ER/10831-2	NTIS, PC A02/MF A01	DE83000291	MN -34A	8:3157
DOE/ER/40033-29	NTIS, PC A03/MF A01	DE83001640	MN -34D	8:3201
DOE/ER/40048-82-PT8	NTIS, PC A02/MF A01	DE82020190	MN -34C	8:3534
DOE/ER/53132-1	NTIS, PC A03/MF A01	DE83000229	MN -20a	8:3548
DOE/ER/53136-1	NTIS, PC A02/MF A01	DE83000289	MN -20	8:3549
DOE/ER/53140-3	NTIS, PC A02/MF A01	DE83001648	MN -20g	8:3550

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DOE/ER/60033-3	NTIS, PC A04/MF A01	DE83000231	MN -48	8:3045
DOE/ER/70031-9	NTIS, PC A02/MF A01	DE83000356	MN -34C	8:3409
DOE/ES-0003	NTIS, PC A03/MF A01	DE83000892	MN -2	8:3867
DOE/ET/10025-T2	NTIS, PC A11/MF A01	DE83001777	STD -88	8:1603
DOE/ET/10069-T22	NTIS (US Sales Only), PC A12/MF A01	DE83002226	STD -90d	8:1516
DOE/ET/10152-79	NTIS, PC A03/MF A01	DE83001736	MN -90d	8:1517
84	NTIS, PC A05/MF A01	DE83002115	MN -90d	8:1518
DOE/ET/10159-T9	NTIS, PC A05/MF A01	DE83000829	MN -89	8:1519
T10	NTIS MF A01	DE83000830	MN -89	8:1520
T12	NTIS, PC A05/MF A01	DE83000825	MN -89	8:1521
T13	NTIS MF A01	DE83000826	MN -89	8:1522
T14	NTIS, PC A02/MF A01	DE83000827	MN -89	8:1523
T16	NTIS, PC A05/MF A01	DE83000823	MN -89	8:1524
T21	NTIS, PC A14/MF A01	DE83000820	MN -89	8:1583
T23	NTIS, PC A09/MF A01	DE83000821	MN -89	8:1570
DOE/ET/10815-76	NTIS, PC A04/MF A01	DE83000034	STD -90g	8:2440
DOE/ET/12313-4	NTIS, PC A03/MF A01	DE83000875	MN -90h	8:2562
DOE/ET/12547-2	NTIS, PC A05/MF A01	DE83001427	STD -90b	8:1525
DOE/ET/12558-T1-Vol.1	NTIS, PC A11/MF A01	DE82019861	STD -88	8:1604
T1-Vol.2	NTIS, PC A14/MF A01	DE82019719	STD -88	8:1605
DOE/ET/14287-T1	NTIS, PC A06/MF A01	DE82021888	STD -90d	8:1620
DOE/ET/14693-T9	NTIS, PC A03/MF A01	DE82019810	MN -90	8:1597
DOE/ET/14746-4	NTIS, PC A06/MF A01	DE83001356	STD -90i	8:1584
DOE/ET/14759-T4-13a	NTIS, PC A05/MF A01	DE83000849	MN -90c	8:1849
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T10-35	NTIS, PC A04/MF A01	DE83000905	MN -90c	8:1853
DOE/ET/14809-11	NTIS, PC A03/MF A01	DE83000310	MN -90d	8:1854
DOE/ET/15234-T1	NTIS, PC A11/MF A01	DE82019862	MN -93	8:2057
DOE/ET/20279-200	NTIS, PC A03/MF A01	DE83001847	STD -63	8:1973
226	NTIS, PC A02/MF A01	DE83001135	MN -63d	8:1974
227	NTIS, PC A02/MF A01	DE83001136	MN -63d	8:1898
228	NTIS, PC A02/MF A01	DE83001137	MN -63a	8:1899
229	NTIS, PC A02/MF A01	DE83001138	MN -63d	8:1900
230	NTIS, PC A02/MF A01	DE83001139	MN -63d	8:2042
DOE/ET/20310-13	NTIS, PC A10/MF A01	DE83001011	MN -64	8:1990
DOE/ET/27034-T2	NTIS, PC A04/MF A01	DE83000140	MN -66a	8:2032
DOE/ET/28365-9	NTIS, PC A05/MF A01	DE83001152	MN -66a	8:2024
10	NTIS, PC A03/MF A01	DE83000953	MN -66a	8:2031
12-MAP	NTIS, PC A02/MF A01	DE83000955	MN -66a	8:2025
13-MAP	NTIS, PC A02/MF A01	DE83000954	MN -66a	8:2026
15	NTIS, PC A02/MF A01	DE83000956	MN -66a	8:2033
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18	NTIS, PC A04/MF A01	DE83001151	MN -66a	8:2028
DOE/ET/29009-1	NTIS, PC A10/MF A01	DE83000652	STD -97c	8:2083
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DOE/ET/33047-1	NTIS, PC A04/MF A01	DE82022219	MN -34	8:2729
DOE/ET/34015-1	NTIS, PC A03/MF A01	DE83001708	STD -78	8:2108
DOE/ET/34020-3	NTIS (US Sales Only), PC A03/MF A01	DE83002159	STD -78	8:2109
DOE/ET/34026-5	NTIS (US Sales Only), PC A04/MF A01	DE83000258	STD -78	8:2097
DOE/ET/34205-33	NTIS MF A01	DE83000385	STD -78	8:2098
DOE/ET/34212-33	NTIS (US Sales Only), PC A04/MF A01	DE83001106	STD -78	8:2110
DOE/ET/34215-25	NTIS (US Sales Only), PC A02/MF A01	DE83000448	STD -78	8:2099
27	NTIS (US Sales Only), PC A08/MF A01	DE83001002	MN -78	8:2100

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DOE/ET/40110-1	NTIS, PC A13/MF A01	DE83001240	MN -70	8:1721
DOE/ET/46617-T2	NTIS, PC A10/MF A01	DE82021274	MN -70	8:3106
DOE/ET/51013-58	NTIS, PC A08/MF A01	DE83001003	STD -20	8:3551
DOE/ET/52015-T20	NTIS, PC A02/MF A01	DE83001456	MN -20c	8:2563
DOE/ET/53034-64	NTIS, PC A02/MF A01	DE83001371	MN -20g	8:3552
DOE/ET/53041-14	NTIS, PC A02/MF A01	DE83000236	MN -20g	8:3553
DOE/ET/53088-35	NTIS, PC A07/MF A01	DE83000118	MN -20g	8:3554
68	NTIS, PC A04/MF A01	DE83001609	MN -20g	8:3555
DOE/EV/02040-T80	NTIS, PC A02/MF A01	DE83000230	MN -48	8:3039
DOE/EV/03408-26	NTIS, PC A02/MF A01	DE83000300	MN -48	8:3063
DOE/EV/05855-T1	NTIS, PC A02/MF A01	DE83000585	MN -4	8:2664
DOE/EV/10023-T1	NTIS, PC A04/MF A01	DE82022304	MN -11	8:3034
DOE/EV/10034-T1-Vol.1-Exec.Summ.	NTIS, PC A04/MF A01	DE83001761	MN -13	8:2387
DOE/EV/10094-T1	NTIS, PC A03/MF A01	DE83000357	MN -48	8:3056
DOE/EV/10305-7	NTIS, PC A06/MF A01	DE83001372	MN -11	8:1788
DOE/EV/10403-7	NTIS, PC A02/MF A01	DE83001014	MN -11	8:2668
DOE/EV/10447-T1	NTIS, PC A02/MF A01	DE83000437	MN -92a	8:1672
DOE/EV/10665-2	NTIS, PC A02/MF A01	DE83002174	MN -11	8:2951
DOE/EV/12529-21	NTIS, PC A04/MF A01	DE83001414	MN -11	8:3026
DOE/FC/10200-T2	NTIS, PC A09/MF A01	DE83001167	STD -90i	8:2072
DOE/FC/10297-T3	NTIS, PC A03/MF A01	DE82018230	MN -90c	8:1571
DOE/FE/05121-T4	NTIS, PC A03/MF A01	DE83001280	MN -90c	8:1526
DOE/FE/16123-T1	NTIS, PC A04/MF A01	DE83000193	STD -90e	8:2762
DOE/ID/12018-12	NTIS, PC A04/MF A01	DE83000957	MN -66a	8:2041
DOE/ID/12138-2	NTIS, PC A05/MF A01	DE83001426	STD -95f	8:2502
DOE/ID/12172-T1	NTIS, PC A04/MF A01	DE82021288	MN -66a	8:2029
DOE/ID/12274-T1-Vol.1	NTIS, PC A08/MF A01	DE83000777	MN -61	8:1901
T1-Vol.2	NTIS, PC A15/MF A01	DE83000776	MN -61	8:1902
T1-Vol.3	NTIS MF A01	DE83000775	MN -61	8:1903
T1-Vol.4	NTIS, PC A08/MF A01	DE83000774	MN -61	8:1904
T1-Vol.5	NTIS, PC A24/MF A01	DE83000773	MN -61	8:1905
DOE/ID/12276-T1-Bk.1	NTIS, PC A20/MF A01	DE83000704	MN -61	8:1906
T1-Bk.2	NTIS, PC A19/MF A01	DE83000705	MN -61	8:1907
T1-Bk.3	NTIS, PC A13/MF A01	DE83000706	MN -61	8:1908
DOE/ID/12277-T1-Vol.1	NTIS, PC A07/MF A01	DE83000805	MN -61a	8:1909
T1-Vol.2	NTIS, PC A06/MF A01	DE83000806	MN -61a	8:1910
DOE/ID/12329-T1	NTIS, PC A03/MF A01	DE83001384	MN -96	8:2545
DOE/ID/12348-T3	NTIS, PC A02/MF A01	DE83001350	MN -70B	8:1722
DOE/JPL-1012-76	NTIS, PC A16/MF A01	DE83001428	MN -63b	8:1911
1060-53-Vol.1	NTIS, PC A02/MF A01	DE83001329	STD -62	8:1986
1060-53-Vol.2	NTIS, PC A06/MF A01	DE83001330	STD -62	8:1987
DOE/JPL/954929-82/9	NTIS, PC A05/MF A01	DE82019860	STD -63b	8:1912
DOE/JPL/955843-82/7	NTIS, PC A03/MF A01	DE83002195	STD -63b	8:1913
DOE/MC/14603-T12	NTIS, PC A03/MF A01	DE82014478	MN -90b	8:1527
DOE/MC/14718-1213	NTIS, PC A02/MF A01	DE83000576	STD -90i	8:1565
DOE/MC/16026-3-4	NTIS, PC A02/MF A01	DE83001325	MN -90c	8:1528
DOE/MC/16242-4	NTIS, PC A04/MF A01	DE83001870	MN -93	8:2441

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DOE/MC/16372-5	NTIS, PC A02/MF A01	DE83001629	MN -90i	8:1529
DOE/METC/SP-191	NTIS, PC A04/MF A01	DE83001256	STD -90e	8:2058
DOE/NASA/0032-17	NTIS, PC A20/MF A01	DE83001746	MN -96	8:2535
18	NTIS MF A01	DE83001745	MN -96	8:2536
DOE/NASA/10350-30	NTIS, PC A09/MF A01	DE82022524	MN -90f	8:1530
DOE/NASA/12726-17	NTIS, PC A02/MF A01	DE83000791	STD -94c	8:2447
DOE/NASA/13111-11	NTIS, PC A02/MF A01	DE83001399	STD -90f	8:1625
12	NTIS, PC A02/MF A01	DE83001100	STD -90f	8:1626
DOE/NASA/20320-41	NTIS, PC A02/MF A01	DE83001099	STD -60	8:2052
DOE/NASA/51044-25	NTIS, PC A03/MF A01	DE83001577	STD -96	8:2537
28	NTIS, PC A03/MF A01	DE83001124	STD -96	8:2538
DOE/NBM-3001480	NTIS, PC A03/MF A01	DE83001480	MN -70A	8:1723
DOE/NE-0041	NTIS, PC A04/MF A01	DE83001005	STD -2	8:2101
0044-Ver.1	NTIS, PC A06/MF A01	DE83000965	MN -2	8:2180
DOE/NE/50008-T1	NTIS, PC A02/MF A01	DE83001123	MN -22	8:2181
DOE/OR/03054-T13-Vol.1	NTIS, PC A20/MF A01	DE83000986	MN -90d	8:1531
T13-Vol.2	NTIS, PC A14/MF A01	DE83000987	MN -90d	8:1532
DOE/PC/30018-2	NTIS, PC A04/MF A01	DE82021781	STD -90d	8:1533
DOE/PC/30021-T10	NTIS, PC A08/MF A01	DE83001279	STD -90d	8:1855
DOE/PC/30249-T4	NTIS, PC A02/MF A01	DE82020968	MN -90a	8:1534
DOE/PC/30337-T1	NTIS, PC A04/MF A01	DE82019766	MN -90i	8:1535
DOE/PC/40771-6	NTIS, PC A02/MF A01	DE83001740	MN -90d	8:1856
DOE/PC/40786-4	NTIS, PC A04/MF A01	DE83000807	MN -90c	8:1537
DOE/PC/40796-3	NTIS, PC A02/MF A01	DE83001047	MN -90c	8:1538
DOE/PC/40797-4	NTIS, PC A02/MF A01	DE83000795	MN -90d	8:1539
DOE/PC/41035-4	NTIS, PC A03/MF A01	DE83000581	MN -90d	8:1540
DOE/PC/42682-T3	NTIS, PC A05/MF A01	DE82020585	MN -90i	8:1572
DOE/PC/52274-T1	NTIS, PC A02/MF A01	DE82020995	MN -88	8:1606
DOE/PE/02835-T1	NTIS, PC A11/MF A01	DE83000838	MN -98F	8:2370
DOE/R5/10294-2	NTIS, PC A02/MF A01	DE83000674	MN -59c	8:2462
DOE/RA/20322-1	NTIS MF A01	DE83001649	MN -59	8:2005
DOE/RA/23210-2	NTIS, PC A09/MF A01	DE83000446	STD -97e	8:1873
DOE/RA/50316-T1-Attach.1	NTIS, PC A08/MF A01	DE83001606	MN -61a	8:1914
T1-Attach.3	NTIS, PC A06/MF A01	DE83001618	MN -61a	8:1915
T1-Attach.7	NTIS, PC A05/MF A01	DE83001603	MN -61a	8:1916
T1-Attach.8	NTIS, PC A03/MF A01	DE83001602	MN -61a	8:1917
T1-Vol.1	NTIS, PC A07/MF A01	DE83001600	MN -61a	8:1918
DOE/RA/50330-1	NTIS, PC A15/MF A01	DE83000703	MN -61a	8:1919
1-Attach.2	NTIS MF A01	DE83000700	MN -61a	8:1971
1-Attach.5	NTIS, PC A14/MF A01	DE83000693	MN -61a	8:1920
1-Vol.1-Attach.4	NTIS, PC A15/MF A01	DE83000697	MN -61a	8:1921
DOE/RA/50338-1-Vol.1-Attach.A	NTIS, PC A14/MF A01	DE83001166	MN -61a	8:1922
1-Vol.2-Attach.B	NTIS, PC A25/MF A01	DE83001196	MN -61a	8:1923
DOE/RA/50404-1232-App.A-Vol.1	NTIS, PC A18/MF A01	DE83001049	MN -90c	8:1541
1232-App.B-Vol.1	NTIS, PC A07/MF A01	DE83001051	MN -90c	8:1585
1232-App.B-Vol.2	NTIS, PC A09/MF A01	DE83001052	MN -90c	8:1586
1232-App.D-Vol.3	NTIS, PC A10/MF A01	DE83001056	MN -90c	8:1542
1232-App.D-Vol.4	NTIS, PC A23/MF A01	DE83001057	MN -90c	8:3031
1232-App.D-Vol.5	NTIS, PC A22/MF A01	DE83001058	MN -90c	8:3032
1232-App.L	NTIS, PC A04/MF A01	DE83001075	MN -90c	8:1543
1232-App.P	NTIS, PC A06/MF A01	DE83001082	MN -90c	8:1544
1232-App.Q-Vol.1	NTIS, PC A18/MF A01	DE83001083	MN -90c	8:1587
1232-App.Q-Vol.2	NTIS, PC A17/MF A01	DE83001084	MN -90c	8:1588
1232-App.Q-Vol.3	NTIS, PC A13/MF A01	DE83001085	MN -90c	8:1589

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1232-App.Q.Vol.6	NTIS MF A01	DE83001088	MN -90c	8:1545
DOE/RG/10572-T1-Vol.3-Bk.1	NTIS, PC A08/MF A01	DE83000523	MN -98B	8:1646
DOE/SF/01424-45	NTIS, PC A06/MF A01	DE83000260	STD -92a	8:1636
DOE/SF/01484-T4	NTIS, PC A02/MF A01	DE82007119	MN -90c	8:1546
DOE/SF/01802-61	NTIS, PC A06/MF A01	DE83000259	STD -92a	8:1637
DOE/SF/10888-T1	NTIS, PC A06/MF A01	DE82021659	STD -92a	8:1638
DOE/SF/11440-T2	NTIS, PC A03/MF A01	DE82018279	MN -78	8:2135
DOE/SF/11492-T3	NTIS, PC A04/MF A01	DE83000048	MN -59b	8:2006
T7	NTIS, PC A05/MF A01	DE83000147	MN -62e	8:1988
DOE/SR-WM-83-1	NTIS, PC A10/MF A01	DE83001695	MN -70	8:1724
DOE/TIC-3389	NTIS MF A01	DE82012272	STD -70	8:1725
4585-Rev.3	NTIS	DE82016597	STD -2	8:3899
DOE/TIC/EGC-81	NTIS, PC A05/MF A01	DE82003277	MN -13	8:2529
82/ 1	NTIS, PC A05/MF A01	DE82003278	MN -13	8:2530
DOE/TRU-8202	NTIS, PC A03/MF A01	DE83001529	STD -70	8:1726
DP-1631	NTIS, PC A08/MF A01	DE83001657	STD -70	8:1727
DP-MS-82-39	NTIS, PC A03/MF A01	DE83000626	MN -83	8:1695
EDF-R-81H404351	NTIS (US Sales Only), PC A04/MF A01	DE82702543	MN -41	8:2952
EGG-1183-1828	NTIS, PC A04/MF A01	DE83001733	STD -41	8:2990
1183-6003	NTIS, PC A02/MF A01	DE82017069	MN -32	8:3873
2215-Vol.2	NTIS, PC A05/MF A01	DE83002087	STD -66e	8:2043
EGG-EE-5924	NTIS, PC A04/MF A01	DE83000492	MN -80	8:2233
5965	NTIS, PC A02/MF A01	DE83000491	MN -80	8:2234
EGG-HYD-6024	NTIS, PC A03/MF A01	DE83001353	MN -97e	8:1871
EGG-M-9181	NTIS, PC A02/MF A01	DE83000589	MN -78	8:2262
03482	NTIS, PC A02/MF A01	DE83000409	MN -78	8:2263
03782	NTIS, PC A02/MF A01	DE83000413	MN -78	8:2264
03982	NTIS, PC A02/MF A01	DE83000564	MN -78	8:2102
04082	NTIS, PC A02/MF A01	DE83000545	MN -78	8:2265
04182	NTIS, PC A02/MF A01	DE83000548	MN -78	8:2266
04382	NTIS, PC A02/MF A01	DE83000539	MN -78	8:2235
04782	NTIS, PC A02/MF A01	DE83000411	MN -78	8:2267
05582	NTIS, PC A02/MF A01	DE83000565	MN -78	8:2111
05982	NTIS, PC A02/MF A01	DE83000590	MN -34C	8:3410
06582	NTIS, PC A02/MF A01	DE83000684	MN -78	8:2244
06682	NTIS, PC A02/MF A01	DE83000685	MN -78	8:2268
06882	NTIS, PC A02/MF A01	DE83000559	MN -20e	8:3764
07082	NTIS, PC A02/MF A01	DE83000756	MN -80	8:2236
07182	NTIS, PC A02/MF A01	DE83000538	MN -70	8:1728
07582	NTIS, PC A03/MF A01	DE83000561	MN -32	8:3874
08581	NTIS, PC A02/MF A01	DE83000588	MN -78	8:2269
08781	NTIS, PC A02/MF A01	DE83000540	MN -78	8:2270
10781	NTIS, PC A02/MF A01	DE83000755	MN -78	8:2112
11682	NTIS, PC A02/MF A01	DE83000563	MN -80	8:2219
15382	NTIS, PC A02/MF A01	DE83000547	MN -78	8:2271
17082	NTIS, PC A02/MF A01	DE83000566	MN -78	8:2272
17782	NTIS, PC A02/MF A01	DE83000537	MN -78	8:2273
17982	NTIS, PC A02/MF A01	DE83000591	MN -34C	8:3411
18282	NTIS MF A01	DE83000158	MN -70B	8:1729
18982	NTIS, MF A01	DE83000042	MN -70B	8:1730
19282	NTIS, PC A02/MF A01	DE83000041	MN -70B	8:1731
19482	NTIS, PC A02/MF A01	DE83001352	MN -70B	8:1732
20282	NTIS, PC A02/MF A01	DE83000040	MN -70B	8:1733
EGG-ME-5929	NTIS, PC A03/MF A01	DE83000490	MN -2	8:2707
EGG-PHYS-6012	NTIS, PC A03/MF A01	DE83001142	MN -80	8:2274
EGG-PR-5784	NTIS, PC A19/MF A01	DE83000682	MN -80	8:2245
EIR-423	NTIS (US Sales Only), PC A05/MF A01	DE82750639	MN -59c	8:2015
427	NTIS (US Sales Only), PC A06/MF A01	DE82750658	MN -59c	8:2016
ENICO-1120	NTIS, PC A04/MF A01	DE83000790	STD -70	8:1734
EPA-AA-TEB-511-80-5	*See* PB-82-178534			8:2489

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EPRI-CS-				
2555	NTIS, PC A15/MF A01	DE83900267	MN -90	8:2059
2559	NTIS, PC A13/MF A01	DE83900146	MN -90i	8:1573
2574	NTIS, PC A16/MF A01	DE83001249	MN -90i	8:1590
EPRI-EL-				
2545	NTIS, PC A14/MF A01	DE83900260	MN -97	8:2088
EPRI-EM-				
2351-Vol.3-Pt.2	NTIS, PC A15/MF A01	DE83001252	MN -94e	8:2346
EPRI-NP-				
2014-Vol.2	*See* NUREG/CR-2444-Vol.2		MN -78	8:2311
2080-Vol.1a	NTIS, PC A19/MF A01	DE83900191	MN -80	8:2275
2080-Vol.1b	NTIS, PC A23/MF A01	DE83900156	MN -80	8:2276
2080-Vol.2	NTIS, PC A21/MF A01	DE83900190	MN -80	8:2277
2080-Vol.3	NTIS, PC A08/MF A01	DE83900271	MN -80	8:2278
2080-Vol.6	NTIS, PC A10/MF A01	DE83900272	MN -80	8:2738
2080-Vol.7	NTIS, PC A99/MF A01	DE83900270	MN -80	8:2279
2562	NTIS, PC A12/MF A01	DE83001224	MN -2	8:2395
2578	NTIS, PC A08/MF A01	DE83900265	MN -78	8:2280
2598	NTIS, PC A05/MF A01	DE83900273	MN -78	8:2281
2611-Vol.1	NTIS, PC A04/MF A01	DE83900266	MN -78	8:2113
2615	NTIS, PC A04/MF A01	DE83900275	MN -78	8:2282
ESG-DOE-				
13383	*See* DOE/PC/30018-2	DE82021781	STD -90d	8:1533
13384	NTIS, PC A10/MF A01	DE83001145	STD -90d	8:1547
EUR-				
5914-DE	European Community Information Service, 2100 M St., N.W., Washington, DC 20037		ND -80	8:2182
6970-EN	NTIS PC E06/MF E06			8:2345
7051-DE	NTIS PC E09/MF E09			8:2143
7052-DE	NTIS PC E04/MF E04			8:1787
7064-DE	NTIS PC E03/MF E03			8:2478
7075-DE	*See* PB-82-205410			8:2419
7093-EN	*See* PB-82-187444			8:1969
7117-IT	NTIS PC E08/MF E08			8:2036
7120-FR	NTIS, PC A05/MF A01			8:2047
7126/ 1EN	NTIS PC E02/MF E02			8:2037
7142-EN	NTIS PC E03/MF E03			8:2230
7143-EN	NTIS PC E03/MF E03			8:2107
7144-EN	NTIS PC E11/MF E11			8:2231
7163-FR	European Community Information Service, 2100 M St., N.W., Washington, DC 20037		ND -63	8:1924
7189-EN	NTIS PC E11/MF E11			8:2514
7190-FR	European Community Information Service, 2100 M St., N.W., Washington, DC 20037		ND -96	8:2531
7200-FR	NTIS PC E05/MF E05			8:2038
7318-EN	NTIS PC E09/MF E09			8:2039
7319-DE	NTIS PC E12/MF E12			8:2040
7425(Pt.2)	NTIS (US Sales Only), PC A25/MF A01	DE83780038	MN -20	8:3605
7702-EN	European Community Information Service, 2100 M Street NW, Suite 707, Washington, DC 20037		ND -59a	8:2007
7793-EN	European Community Information Service, 2100 M Street NW, Suite 707, Washington, DC 20037		ND -61c	8:2692
7795-EN	European Community Information Service, 2100 M Street NW, Suite 707, Washington, DC 20037		ND -63	8:1925
7938-EN	European Community Information Service, 2100 M Street NW, Suite 707, Washington, DC 20037		ND -13	8:2214
EUR-CEA-FC-				
1138	NTIS (US Sales Only), PC A03/MF A01	DE82703134	MN -20	8:3606
1142	NTIS (US Sales Only), PC A03/MF A01	DE82703135	MN -20	8:3607
FDA/BRH-				
82/ 58	*See* PB-82-185158			8:3052
FE-				
1484-8	*See* DOE/SF/01484-T4	DE82007119	MN -90c	8:1546
2044-52	*See* ESG-DOE-13384	DE83001145	STD -90d	8:1547
2291-100A	*See* CW-WR-76-020.100A	DE82022201	STD -90e	8:2056
2893-97	*See* DOE/ET/10069-T22	DE83002226	STD -90d	8:1516
10152-79	*See* DOE/ET/10152-79	DE83001736	MN -90d	8:1517
FEI-				
1193	NTIS (US Sales Only), PC A02/MF A01	DE82702557	MN -38	8:2227
1220	NTIS (US Sales Only), PC A02/MF A01	DE82702558	MN -28	8:2803
FERC/EIS-				
0031	NTIS, PC A21/MF A01	DE83001832	MN -97e	8:1876
FERMILAB-				
81/ 81-EXP-R	NTIS, PC A02/MF A01	DE82022448	MN -28	8:3202
FERMILAB/TM-				
1129	NTIS, PC A02/MF A01	DE83000618	MN -28	8:2867
1132	NTIS, PC A02/MF A01	DE83000620	MN -28	8:2788
1133	NTIS, PC A02/MF A01	DE83000621	MN -28	8:2804
1136	NTIS, PC A03/MF A01	DE83000622	MN -28	8:2805
FRNC-TH-				
1057	NTIS (US Sales Only), PC A05/MF A01	DE82780756	MN -25	8:2564
1064	NTIS (US Sales Only), PC A05/MF A01	DE82780801	MN -41	8:3046
1065	NTIS (US Sales Only), PC A08/MF A01	DE82780802	MN -48	8:3525
1066	NTIS (US Sales Only), PC A07/MF A01	DE82780538	MN 37	8:2868

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GA-				
9035	*See* AD-A-951600/6			8:3508
GA-A-				
16792	NTIS, PC A02/MF A01	DE83000311	MN -77	8:2136
16816	NTIS, PC A05/MF A01	DE83001162	STD -20	8:3773
16852	NTIS, PC A02/MF A01	DE83001912	STD -86	8:1735
16868	NTIS, PC A03/MF A01	DE82021380	MN -77	8:2283
16869	NTIS, PC A03/MF A01	DE82021383	MN -77	8:2284
GAO/PAD-				
82-39	General Accounting Office, PO Box 6015, Gaithersburg, MD 20760		MN -96	8:2481
GC-TR-				
82-182	*See* AD-A-111982/5			8:1655
GE/SRD-				
82-044	*See* DOE/ER/10382-3	DE82018278	MN -34A	8:2560
GEND-INF-				
025	NTIS, PC A03/MF A01	DE83000758	MN -78	8:2114
GEPP-OP-				
565	NTIS, PC A02/MF A01	DE83000092	MN -38	8:2708
GJBX-				
193-82	NTIS, PC A07/MF A01	DE83000764	MN -51	8:1680
219(82)	NTIS, PC A02/MF A01	DE83001386	MN -51	8:1681
GKSS-				
78/ E/ 24	NTIS (US Sales Only), MF A01	DE82750528	MN -32	8:3158
81/ E/ 29	NTIS (US Sales Only), PC A02/MF A01	DE82750212	MN -41	8:3020
81/ E/ 30	NTIS (US Sales Only), MF A01	DE82750198	MN -04	8:2669
81/ E/ 31	NTIS (US Sales Only), MF A01	DE82750199	MN -04	8:2670
81/ E/ 32	NTIS (US Sales Only), MF A01	DE82750191	MN -33	8:2257
81/ E/ 35	NTIS (US Sales Only), PC A02/MF A01	DE82750202	MN -38	8:2739
81/ E/ 36	NTIS (US Sales Only), MF A01	DE82750560	MN -38	8:2060
81/ E/ 49	NTIS (US Sales Only), MF A01	DE82750534	MN -80	8:2103
81/ E/ 50	NTIS (US Sales Only), MF A01	DE82750562	MN -80	8:2285
81/ E/ 51	NTIS (US Sales Only), MF A01	DE82750561	MN -11	8:3028
81/ E/ 52	NTIS (US Sales Only), MF A01	DE82750563	MN -38	8:2740
81/ E/ 54	NTIS (US Sales Only), MF A01	DE82750535	MN -41	8:2286
82/ E/ 1	NTIS (US Sales Only), PC A04/MF A01	DE82750655	MN -02	8:3868
GRS-				
29	NTIS (US Sales Only), MF A01	DE82750192	MN -79p	8:2287
GSF-S-				
777	NTIS (US Sales Only), MF A01	DE82750208	MN -37	8:2869
GSF-T-				
117	NTIS (US Sales Only), MF A01	DE82750216	MN -51	8:1736
HEDL-SA-				
2612-FP	NTIS, PC A02/MF A01	DE83000485	MN -79e	8:2246
2664-FP	NTIS, PC A02/MF A01	DE83000486	MN -79i	8:2247
2694	NTIS, PC A02/MF A01		MN -79	8:2248
2703FP	NTIS, PC A02/MF A01	DE83000508	MN -34C	8:3350
2704-FP	NTIS, PC A02/MF A01	DE83000507	MN -34C	8:3351
2724-FP	NTIS, PC A02/MF A01	DE83000506	MN -79p	8:2288
2725	NTIS, PC A02/MF A01	DE83000509	MN -79b	8:2289
HEDL-TME-				
75-98	NTIS, PC A05/MF A01	DE83000085	STD -79i	8:2290
HHE-				
80-185-842	*See* PB-82-172172			8:3090
HMI-				
356	NTIS (US Sales Only), MF A01	DE82750638	MN -02	8:3254
HMI-B-				
361	NTIS (US Sales Only), PC A06/MF A01	DE82750657	MN -37	8:2870
364	NTIS (US Sales Only), MF A01	DE82750530	MN -34A	8:2565
365	NTIS (US Sales Only), MF A01	DE82750646	MN -37	8:2871
HTGL-				
231	NTIS MF A01	DE83000522	MN -90g	8:2442
IAE-				
3382/ 7	NTIS (US Sales Only), PC A02/MF A01	DE82702996	MN -20	8:3608
3408/ 7	NTIS (US Sales Only), PC A02/MF A01	DE82703136	MN -20	8:3774
3414/ 10	NTIS (US Sales Only), PC A02/MF A01	DE82703151	MN -93	8:2443
3415/ 8	NTIS (US Sales Only), PC A03/MF A01	DE82703137	MN -20	8:3775
3426/ 7	NTIS (US Sales Only), PC A02/MF A01	DE82703138	MN -20	8:3609
IAEA-CN-				
41/ Q-3	NTIS, PC A02/MF A01	DE82022298	MN -20d	8:3776
IAEA-R-				
2010-F	NTIS (US Sales Only), PC A09/MF A01	DE82702542	MN -11	8:3000
IAEA-SM-				
260/ 90	*See* LA-UR-82-2807	DE83000611	MN -15	8:1816
IFSR-				
35	*See* DOE/ET/53088-35	DE83000118	MN -20g	8:3554
IFT-P-				
01/ 81	*See* CBPF-NF-006/81	DE82703153	MN -34D	8:3213
IFVE-OEA-				
81-132	NTIS (US Sales Only), PC A02/MF A01	DE82702559	MN -28	8:2806
IFVE-ORI-				
81-128	NTIS (US Sales Only), PC A02/MF A01	DE82702560	MN -28	8:2709
IKE-				
2-51	NTIS (US Sales Only), MF A01	DE82750203	MN -38	8:2741
4-103	NTIS (US Sales Only), MF A01	DE82750195	MN -98F	8:2371

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5-212	NTIS (US Sales Only), PC A07/MF A01	DE82750204	MN -38	8:2710
INIS-mf-				
6728	NTIS (US Sales Only), PC A06/MF A01	DE83780003	MN -11	8:3015
6935	NTIS (US Sales Only), PC A05/MF A01	DE82780800	MN -48	8:3001
6975	NTIS (US Sales Only), PC A02/MF A01	DE82780762	MN -41	8:2340
6976	NTIS (US Sales Only), PC A02/MF A01	DE82780763	MN -41	8:2341
6977	NTIS (US Sales Only), PC A03/MF A01	DE82780772	MN -78	8:2342
6978	NTIS (US Sales Only), PC A02/MF A01	DE82780764	MN -41	8:2343
6979	NTIS (US Sales Only), PC A02/MF A01	DE82780765	MN -41	8:2344
6985	NTIS (US Sales Only), PC A05/MF A01	DE82780793	MN -2	8:3047
6987	NTIS (US Sales Only), PC A07/MF A01	DE82780769	MN -48	8:3064
6988	NTIS (US Sales Only), PC A10/MF A01	DE82780752	MN -34C	8:3352
6989	NTIS (US Sales Only), PC A06/MF A01	DE82780750	MN -34C	8:3203
6991	NTIS (US Sales Only), PC A07/MF A01	DE82780751	MN -34C	8:3427
6992	NTIS (US Sales Only), PC A08/MF A01	DE82780746	MN -34B	8:3125
6994	NTIS (US Sales Only), PC A08/MF A01	DE82780747	MN -34B	8:3126
6995	NTIS (US Sales Only), PC A10/MF A01	DE82780748	MN -34B	8:3127
6998	NTIS (US Sales Only), PC A06/MF A01	DE82780754	MN -4	8:2695
6999	NTIS (US Sales Only), PC A09/MF A01	DE82780757	MN -48	8:3065
7001	NTIS (US Sales Only), PC A05/MF A01	DE82780773	MN -37	8:2712
7003	NTIS (US Sales Only), PC A05/MF A01	DE82780774	MN -37	8:2713
7006	NTIS (US Sales Only), PC A06/MF A01	DE82780758	MN -48	8:3066
7008	NTIS (US Sales Only), PC A04/MF A01	DE83780014	MN -37	8:2883
7009	NTIS (US Sales Only), PC A04/MF A01	DE83780002	MN -51	8:1682
7011	NTIS (US Sales Only), PC A03/MF A01	DE82780771	MN -80	8:2291
7012	NTIS (US Sales Only), PC A05/MF A01	DE82780753	MN -34C	8:3281
7013	NTIS (US Sales Only), PC A02/MF A01	DE82780766	MN -41	8:2094
7015	NTIS (US Sales Only), PC A06/MF A01	DE82780759	MN -48	8:3067
7016	NTIS (US Sales Only), PC A16/MF A01	DE82780767	MN -78	8:2292
7018	NTIS (US Sales Only), PC A05/MF A01	DE82780768	MN -48	8:3048
7019	NTIS (US Sales Only), PC A05/MF A01	DE82780761	MN -48	8:3068
7020	NTIS (US Sales Only), PC A06/MF A01	DE82780760	MN -48	8:3069
7021	NTIS (US Sales Only), PC A03/MF A01	DE82780770	MN -48	8:3049
7022	NTIS (US Sales Only), PC A02/MF A01	DE82780755	MN -25	8:1847
7023	NTIS (US Sales Only), PC A02/MF A01	DE82780784	MN -2	8:2402
7024	NTIS (US Sales Only), PC A03/MF A01	DE82780785	MN -2	8:2403
7025	NTIS (US Sales Only), PC A02/MF A01	DE82780786	MN -16	8:1796
7026	NTIS (US Sales Only), PC A02/MF A01	DE82780787	MN -86	8:1797
7027	NTIS (US Sales Only), PC A03/MF A01	DE82780776	MN -70	8:1798
7028	NTIS (US Sales Only), PC A02/MF A01	DE82780777	MN -70	8:1716
7029	NTIS (US Sales Only), PC A02/MF A01	DE82780788	MN -15	8:1799
7030	NTIS (US Sales Only), PC A03/MF A01	DE82780789	MN -15	8:1800
7031	NTIS (US Sales Only), PC A02/MF A01	DE82780790	MN -15	8:1801
7032	NTIS (US Sales Only), PC A02/MF A01	DE82780791	MN -15	8:1802
7033	NTIS (US Sales Only), PC A02/MF A01	DE82780792	MN -15	8:1717
7034	NTIS (US Sales Only), PC A02/MF A01	DE82780778	MN -70	8:2293
7035	NTIS (US Sales Only), PC A02/MF A01	DE82780779	MN -2	8:2294
7036	NTIS (US Sales Only), PC A02/MF A01	DE82780780	MN -2	8:2295
7037	NTIS (US Sales Only), PC A02/MF A01	DE82780781	MN -2	8:1803
7039	NTIS (US Sales Only), PC A02/MF A01	DE82780775	MN -2	8:1718
7040	NTIS (US Sales Only), PC A03/MF A01	DE82780783	MN -2	8:2296
7045	NTIS (US Sales Only), PC A04/MF A01; Also available from Library, Democritus NRC	DE82702561	MN -28	8:2769
7046	NTIS (US Sales Only), PC A04/MF A01; Also available from Library, Democritus NRC	DE82702562	MN -28	8:2770
7047	NTIS (US Sales Only), PC A04/MF A01; Also available from Library, Democritus NRC	DE82702563	MN -28	8:2771
7081	NTIS (US Sales Only), PC A06/MF A01	DE82780798	MN -34D	8:3204
7082	NTIS (US Sales Only), PC A08/MF A01	DE82780799	MN -34D	8:3205
7094	NTIS (US Sales Only), PC A08/MF A01	DE82780808	MN -34A	8:3161
7098	NTIS (US Sales Only), PC A06/MF A01	DE82780796	MN -34A	8:3510
7143	NTIS (US Sales Only), PC A06/MF A01	DE83780001	MN -25	8:2567
7148	NTIS (US Sales Only), PC A10/MF A01	DE82780807	MN -34A	8:3162
7150	NTIS (US Sales Only), PC A03/MF A01	DE83780008	MN -48	8:3041
7151	NTIS (US Sales Only), PC A02/MF A01	DE83780022	MN -41	8:1805
7152	NTIS (US Sales Only), PC A02/MF A01	DE83780023	MN -41	8:1806
7153	NTIS (US Sales Only), PC A02/MF A01	DE83780024	MN -41	8:1807
7154	NTIS (US Sales Only), PC A02/MF A01	DE83780025	MN -2	8:1808
7155	NTIS (US Sales Only), PC A02/MF A01	DE83780021	MN -41	8:3526
7156	NTIS (US Sales Only), PC A02/MF A01	DE83780019	MN -70	8:1737
7157	NTIS (US Sales Only), PC A02/MF A01	DE83780018	MN -2	8:3906
7158	NTIS (US Sales Only), PC A02/MF A01	DE83780020	MN -70	8:1738
7159	NTIS (US Sales Only), PC A02/MF A01	DE83780026	MN -2	8:2404
7160	NTIS (US Sales Only), PC A02/MF A01	DE83780027	MN -2	8:2405
7161	NTIS (US Sales Only), PC A02/MF A01	DE83780028	MN -2	8:2406
7162	NTIS (US Sales Only), PC A14/MF A01	DE83780004	MN -11	8:2959
7163	NTIS (US Sales Only), PC A06/MF A01	DE83780012	MN -78	8:2120
7164	NTIS (US Sales Only), PC A09/MF A01	DE83780009	MN -78	8:2300
7165	NTIS (US Sales Only), PC A04/MF A01	DE83780007	MN -48	8:3070
7166	NTIS (US Sales Only), PC A11/MF A01	DE83780011	MN -78	8:2121
7168	NTIS (US Sales Only), PC A05/MF A01	DE83780010	MN -41	8:3527
7169	NTIS (US Sales Only), PC A10/MF A01	DE83780013	MN -20	8:3800
7170	NTIS (US Sales Only), PC A11/MF A01	DE83780029	MN -78	8:3511
7171	NTIS (US Sales Only), PC A06/MF A01	DE83780015	MN -37	8:2884
7172	NTIS (US Sales Only), PC A06/MF A01	DE83780005	MN -48	8:3071

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7173	NTIS (US Sales Only), PC A06/MF A01	DE82780805	MN -34D	8:3428
7174	NTIS (US Sales Only), PC A13/MF A01	DE83780006	MN -48	8:3040
7183	NTIS (US Sales Only), PC A07/MF A01	DE83780017	MN -2	8:2520
7187	NTIS (US Sales Only), PC A06/MF A01	DE82780809	MN -34A	8:3512
7188	NTIS (US Sales Only), PC A05/MF A01	DE82780812	MN -20	8:3655
7190	NTIS (US Sales Only), PC A07/MF A01	DE83780016	MN -37	8:2885
7192	NTIS (US Sales Only), PC A03/MF A01	DE82780806	MN -34D	8:3429
7264	NTIS (US Sales Only), PC A02/MF A01	DE83780065	MN -2	8:1719
7265	NTIS (US Sales Only), PC A02/MF A01	DE83780066	MN -2	8:2407
7266	NTIS (US Sales Only), PC A03/MF A01	DE83780067	MN -78	8:2408
7270	NTIS (US Sales Only), PC A02/MF A01	DE83780068	MN -2	8:2409
7271	NTIS (US Sales Only), PC A02/MF A01	DE83780069	MN -2	8:2410
7272	NTIS (US Sales Only), PC A03/MF A01	DE83780070	MN -2	8:2421
7276	NTIS (US Sales Only), PC A02/MF A01	DE83780063	MN -70	8:1739
7277	NTIS (US Sales Only), PC A02/MF A01	DE83780064	MN -70	8:1740
7281	NTIS (US Sales Only), PC A02/MF A01	DE83780077	MN -2	8:1809
7282	NTIS (US Sales Only), PC A02/MF A01	DE83780071	MN -2	8:2425
7283	NTIS (US Sales Only), PC A02/MF A01	DE83780072	MN -2	8:2426
7284	NTIS (US Sales Only), PC A02/MF A01	DE83780073	MN -2	8:2411
7285	NTIS (US Sales Only), PC A02/MF A01	DE83780074	MN -2	8:2412
7290	NTIS (US Sales Only), PC A05/MF A01	DE83780078	MN -25	8:2396
7300	NTIS (US Sales Only), PC A09/MF A01	DE83780075	MN -2	8:2413
7308	NTIS (US Sales Only), PC A02/MF A01	DE83780076	MN -2	8:3907
INIS-SU-				
125	NTIS (US Sales Only), PC A25/MF A01	DE83780083	MN -34C	8:3256
IPEN-Inf-				
10	NTIS (US Sales Only), PC A03/MF A01	DE83900314	MN -32	8:3517
IPNO-PhN-				
81-20	NTIS (US Sales Only), PC A02/MF A01	DE82702805	MN -34C	8:3309
81-22	NTIS (US Sales Only), PC A02/MF A01	DE82702806	MN -34C	8:3206
IPNO-RC-				
81-07	NTIS (US Sales Only), PC A02/MF A01	DE82702807	MN -34C	8:3403
IPNO-T-				
81-03	NTIS (US Sales Only), PC A05/MF A01	DE82702808	MN -34C	8:3337
IPNO-TH-				
81-36	NTIS (US Sales Only), PC A03/MF A01	DE82702797	MN -34C	8:3236
81-43	NTIS (US Sales Only), PC A03/MF A01	DE82702798	MN -34C	8:3535
81-45	NTIS (US Sales Only), PC A06/MF A01	DE82702799	MN -34C	8:3338
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1/ 192	NTIS (US Sales Only), MF A01	DE82750529	MN -20d	8:3813
2/ 256	NTIS (US Sales Only), MF A01	DE82750532	MN -20d	8:3814
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83	NTIS (US Sales Only), PC A03/MF A01	DE82702564	MN -28	8:2791
85	NTIS (US Sales Only), PC A02/MF A01	DE82702548	MN -41	8:3816
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8205-003-VOL-1	*See* AD-A-111826/4			8:3140
ISN-				
81-42	NTIS (US Sales Only), PC A03/MF A01	DE82702809	MN -34C	8:3394
ITEP-				
9(1982)	NTIS (US Sales Only), PC A02/MF A01	DE82702980	MN -34D	8:3237
17(1982)	NTIS (US Sales Only), PC A02/MF A01	DE82702978	MN -34D	8:3536
19(1982)	NTIS (US Sales Only), PC A03/MF A01	DE82702979	MN -34D	8:3238
92(1981)	NTIS (US Sales Only), PC A02/MF A01	DE82702981	MN -34D	8:3226
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81-8-E	NTIS (US Sales Only), PC A02/MF A01	DE82702982	MN -34D	8:3239
JINR-				
9-81-539	NTIS (US Sales Only), PC A02/MF A01	DE82702565	MN -28	8:2792
E-2-81-777	NTIS (US Sales Only), PC A02/MF A01	DE82702983	MN -34D	8:3240
E-2-81-801	NTIS (US Sales Only), PC A02/MF A01	DE82702984	MN -34D	8:3542
E-2-81-824	NTIS (US Sales Only), PC A02/MF A01	DE82702985	MN -34D	8:3241
E-2-81-854	NTIS (US Sales Only), PC A02/MF A01	DE82702986	MN -34D	8:3242
E4-82-133	Joint Inst. for Nuclear Research, Dubna, USSR		ND -34	8:3227
E4-82-273	Joint Inst. for Nuclear Research, Dubna, USSR		ND -34B	8:3537
E-7-81-278	NTIS (US Sales Only), PC A02/MF A01	DE82702991	MN -34A	8:3172
P3-82-305	Joint Institute for Nuclear Research, Dubna, USSR		ND -34C	8:3377
P3-82-309	Joint Institute for Nuclear Research, Dubna, USSR		ND -34C	8:3378
P4-82-358	Joint Inst. for Nuclear Research, Dubna, USSR		ND -34	8:3404
P4-82-418	Joint Inst. for Nuclear Research, Dubna, USSR		ND -34D	8:3173
P5-82-239	Joint Institute for Nuclear Research, Dubna, USSR		ND -34	8:3875
P5-82-242	Joint Institute for Nuclear Research, Dubna, USSR		ND -34	8:3876
P5-82-246	Joint Institute for Nuclear Research, Dubna, USSR		ND -34D	8:3243
P5-82-293	Joint Institute for Nuclear Research, Dubna, USSR		ND -34	8:3184
P5-82-346	Joint Inst. for Nuclear Research, Dubna, USSR		ND -32	8:3877
P5-82-381	Joint Institute for Nuclear Research, Dubna, USSR		ND -32	8:3878
P5-82-395	Joint Institute for Nuclear Research, Dubna, USSR		ND -34	8:3244
P9-82-168	Joint Inst. for Nuclear Research, Dubna, USSR		ND -28	8:2793
P9-82-301	Joint Inst. for Nuclear Research, Dubna, USSR		ND -28	8:2776
P11-82-205	Joint Institute for Nuclear Research, Dubna, USSR		ND -32	8:3879
P11-82-230	Joint Inst. for Nuclear Research, Dubna, USSR		ND -34	8:2794
P11-82-233	Joint Inst. for Nuclear Research, Dubna, USSR		ND -34	8:2795
P11-82-290	Joint Institute for Nuclear Research, Dubna, USSR		ND -32	8:3880
P11-82-291	Joint Institute for Nuclear Research, Dubna, USSR		ND -32	8:3881
P11-82-298	Joint Institute for Nuclear Research, Dubna, USSR		ND -32	8:3882
P11-82-314	Joint Institute for Nuclear Research, Dubna, USSR		ND -34	8:3174

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P15-82-320	Joint Institute for Nuclear Research, Dubna, USSR		ND -34	8:3175
R-2-81-749	NTIS (US Sales Only), PC A02/MF A01	DE82702987	MN -34D	8:3245
R-17-81-651	NTIS (US Sales Only), PC A02/MF A01	DE82702992	MN -34A	8:3518
JINR-R-				
1-81-753	NTIS (US Sales Only), PC A02/MF A01	DE82702810	MN -34C	8:3395
3-81-601	NTIS (US Sales Only), PC A02/MF A01	DE82702811	MN -34C	8:3414
8-81-613	NTIS (US Sales Only), PC A02/MF A01	DE82703152	MN -34A	8:3532
9-81-468	NTIS (US Sales Only), PC A02/MF A01	DE82702566	MN -28	8:2809
9-81-531	NTIS (US Sales Only), PC A02/MF A01	DE82703139	MN -20	8:3727
JPL-PUBL-				
82-72	*See* DOE/ET/12547-2	DE83001427	STD -90b	8:1525
82-83	*See* DOE/ID/12138-2	DE83001426	STD -95f	8:2502
Juel-				
1685	NTIS (US Sales Only), MF A01	DE82750518	MN -77	8:1696
1702	NTIS (US Sales Only), MF A01	DE82750558	MN -25	8:2138
1714	NTIS (US Sales Only), MF A01	DE82750544	MN -77	8:2139
1717	NTIS (US Sales Only), PC A06/MF A01	DE82903949	MN -48	8:3089
1720	NTIS (US Sales Only), MF A01	DE82750231	MN -20g	8:3728
1721	NTIS (US Sales Only), PC A07/MF A01	DE82903822	MN -25	8:2568
1730	NTIS (US Sales Only)MF A01	DE82902715	MN -37	8:2569
1738	NTIS (US Sales Only), PC A07/MF A01	DE82750585	MN -80	8:1697
1740	NTIS (US Sales Only), PC A02/MF A01	DE82750573	MN -32	8:2901
1981	NTIS (US Sales Only), PC A05/MF A01	DE82902923	MN -4	8:2960
Juel-Conf-				
45	NTIS (US Sales Only), PC A99/MF A01	DE82780795	MN -28	8:2840
Juel-Spez-				
91	NTIS (US Sales Only), PC A03/MF A01	DE82750583	MN -90c	8:1561
94	NTIS (US Sales Only), MF A01	DE82750546	MN -25	8:2572
96	NTIS (US Sales Only), MF A01	DE82750196	MN -25	8:2573
100	Fachinformationszentrum Energie, Physik, Mathematik, Karlsruhe, Germany		MN -60	8:2049
101	NTIS (US Sales Only), PC A04/MF A01	DE82902951	MN -4	8:2682
105	NTIS (US Sales Only), PC A07/MF A01	DE82903761	MN -41	8:3002
106	NTIS (US Sales Only), MF A01	DE82750189	MN -80	8:2140
116	NTIS (US Sales Only), PC A04/MF A01	DE82903745	MN -32	8:3883
122	NTIS (US Sales Only), MF A01	DE82750190	MN -80	8:2222
124	NTIS (US Sales Only), MF A01	DE82750526	MN -77	8:2301
125	NTIS (US Sales Only), PC A08/MF A01	DE82904402	MN -32	8:3884
126	NTIS (US Sales Only), PC A04/MF A01	DE82750587	MN -11	8:2992
130	NTIS (US Sales Only), MF A01	DE82750548	MN -86	8:1706
131	NTIS (US Sales Only), PC A05/MF A01	DE82750588	MN -34C	8:3501
JYFL-RR-				
15/ 81	NTIS (US Sales Only), PC A02/MF A01	DE82702812	MN -34C	8:3379
KEK-				
80-11	NTIS (US Sales Only), PC A02/MF A01	DE82702567	MN -28	8:2857
80-12	NTIS (US Sales Only), PC A03/MF A01	DE82702568	MN -28	8:2842
80-13	NTIS (US Sales Only), PC A05/MF A01	DE82702569	MN -28	8:2858
80-17	NTIS (US Sales Only), PC A02/MF A01	DE82702570	MN -28	8:2844
KFK-				
2943	NTIS (US Sales Only), MF A01	DE82750543	MN -10	8:1707
3034	NTIS (US Sales Only), MF A01	DE82750211	MN -11	8:3003
3035	NTIS (US Sales Only), MF A01	DE82750200	MN -04	8:2673
3085	NTIS (US Sales Only), PC A05/MF A01	DE82750574	MN -25	8:2574
3090	NTIS (US Sales Only), MF A01	DE82750210	MN -11	8:2954
3111	NTIS (US Sales Only), MF A01	DE82750187	MN -79	8:2157
3121	NTIS (US Sales Only), PC A03/MF A01	DE82750584	MN -79p	8:2302
3145	NTIS (US Sales Only), MF A01	DE82750542	MN -25	8:2575
3151	NTIS (US Sales Only), PC A06/MF A01	DE82750575	MN -25	8:2576
3154	NTIS (US Sales Only), MF A01	DE82750194	MN -78	8:2303
3167	NTIS (US Sales Only), MF A01	DE82750533	MN -38	8:1741
3188	NTIS (US Sales Only), MF A01	DE82750201	MN -04	8:1708
3199	NTIS (US Sales Only), PC A04/MF A01	DE82750656	MN -25	8:2577
3201	NTIS (US Sales Only), MF A01	DE82750197	MN -25	8:2626
3202/ 1	NTIS (US Sales Only), MF A01	DE82750652	MN -21	8:3817
3204	NTIS (US Sales Only), MF A01	DE82750185	MN -86	8:1709
3208	NTIS (US Sales Only), MF A01	DE82750220	MN -34D	8:3228
3212	NTIS (US Sales Only), MF A01	DE82750207	MN -37	8:2902
3213	NTIS (US Sales Only), MF A01	DE82750186	MN -16	8:1810
3218	NTIS (US Sales Only), MF A01	DE82750214	MN -41	8:3072
3222	NTIS (US Sales Only), MF A01	DE82750564	MN -70	8:1742
3226	NTIS (US Sales Only), MF A01	DE82750229	MN -34C	8:3276
3230	NTIS (US Sales Only), PC A04/MF A01	DE82750586	MN -70	8:2578
3249	NTIS (US Sales Only), MF A01	DE82750527	MN -51	8:3004
3254	NTIS (US Sales Only), MF A01	DE82750536	MN -77	8:2158
3262	NTIS (US Sales Only), PC A05/MF A01	DE82750580	MN -34C	8:2217
3265	NTIS (US Sales Only), MF A01	DE82750647	MN -48	8:3073
3266	NTIS (US Sales Only), PC A07/MF A01	DE82750589	MN -78	8:3035
3280	NTIS (US Sales Only), MF A01	DE82750653	MN -34C	8:3257
KFK-AFR-				
004	NTIS (US Sales Only), MF A01	DE82750648	MN -23	8:1831
KFKI-				
1982-54	NTIS (US Sales Only), PC A02/MF A01	DE83900361	MN -34	8:3531
KFTI-				
81-42	NTIS (US Sales Only), PC A03/MF A01	DE82703140	MN -20	8:3818

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KMSF-U-				
361-Rev.1	NTIS, PC A02/MF A01	DE83000035	MN -21	8:3819
1213	NTIS, PC A02/MF A01	DE83001385	MN -21	8:3820
KURRI-TR-				
209	NTIS (US Sales Only), PC A03/MF A01	DE82702550	MN -41	8:2250
211	NTIS (US Sales Only), PC A03/MF A01	DE82702544	MN -41	8:2240
LA-				
8787-NERP	NTIS, PC A11/MF A01	DE83001934	STD -11	8:2995
9145-MS	NTIS, PC A03/MF A01	DE83002311	STD -41	8:2961
9424-MS	NTIS, PC A05/MF A01	DE83002310	STD -59c	8:2008
9440-MS	NTIS, PC A05/MF A01	DE83000463	STD -15	8:1811
9448-MS	NTIS, PC A06/MF A01	DE83001955	STD -32	8:3885
9465	NTIS, PC A02/MF A01	DE83000428	STD -41	8:3055
9469-MS	NTIS, PC A02/MF A01	DE83002298	STD -10	8:1710
9473-PR	NTIS, PC A06/MF A01	DE83002302	STD -59c	8:2009
9480-MS	NTIS, PC A02/MF A01	DE83000430	STD -15	8:1812
9492-MS	NTIS, PC A03/MF A01	DE83002309	STD -90i	8:1621
9504-T	NTIS, PC A04/MF A01	DE83000462	STD -34C	8:3208
9505-T	NTIS, PC A10/MF A01	DE83002347	STD -34C	8:3277
9516-MS	NTIS, PC A02/MF A01	DE83002308	STD -34	8:3538
9520-MS	NTIS, PC A02/MF A01	DE83002304	STD -20f	8:3821
9526-MS	NTIS, PC A04/MF A01	DE83002312	STD -98F	8:2430
9547-PR	NTIS, PC A02/MF A01	DE83002301	STD -23	8:1835
9548-PR	NTIS, PC A02/MF A01	DE83002299	STD -23	8:1836
LA-UR-				
82-1021	NTIS, PC A03/MF A01	DE82014080	MN -38	8:2579
82-1504	NTIS, PC A02/MF A01	DE82015732	MN -21	8:3822
82-1572	NTIS, PC A02/MF A01	DE82018367	MN -32	8:3886
82-1819	NTIS, PC A02/MF A01	DE82017328	MN -32	8:3887
82-2348	NTIS, PC A02/MF A01	DE82021776	MN -34B	8:3128
82-2493	NTIS, PC A02/MF A01	DE82021759	MN -34C	8:2846
82-2562	NTIS, PC A02/MF A01	DE83000352	MN -34D	8:3246
82-2596	NTIS, PC A02/MF A01	DE83000331	MN -34C	8:1832
82-2627	NTIS, PC A02/MF A01	DE83000670	MN -34	8:2580
82-2643	NTIS, PC A02/MF A01	DE83000662	MN -34C	8:3418
82-2644	NTIS, PC A02/MF A01	DE83000663	MN -34C	8:3278
82-2650	NTIS, PC A02/MF A01	DE83000667	MN -20c	8:3823
82-2655	NTIS MF A01	DE83000650	MN -32	8:3888
82-2662	NTIS, PC A02/MF A01	DE83000646	MN -34C	8:2847
82-2681	NTIS, PC A03/MF A01	DE83000643	MN -37	8:2848
82-2688	NTIS, PC A02/MF A01	DE83000644	MN -32	8:3521
82-2719	NTIS, PC A02/MF A01	DE83000640	MN -94b	8:2089
82-2720	NTIS, PC A02/MF A01	DE83000641	MN -20b	8:2715
82-2726	NTIS, PC A02/MF A01	DE83000632	MN -28	8:2759
82-2753	NTIS, PC A02/MF A01	DE83000635	MN -15	8:1813
82-2754	NTIS, PC A02/MF A01	DE83000613	MN -10	8:1814
82-2768	NTIS, PC A02/MF A01	DE83000614	MN -34	8:2849
82-2781	NTIS, PC A02/MF A01	DE83000606	MN -15	8:1815
82-2791	NTIS, PC A02/MF A01	DE83000607	MN -34	8:3539
82-2805	NTIS, PC A02/MF A01	DE83000609	MN -78	8:2304
82-2806	NTIS, PC A02/MF A01	DE83000610	MN -78	8:2305
82-2807	NTIS, PC A02/MF A01	DE83000611	MN -15	8:1816
82-2844	NTIS, PC A02/MF A01	DE83001941	MN -34D	8:3129
82-2892	NTIS, PC A02/MF A01	DE83002067	MN -20f	8:3729
82-2931	NTIS, PC A02/MF A01	DE83002063	MN -41	8:2306
82-2973	NTIS, PC A02/MF A01	DE83002060	MN -15	8:1817
82-2975	NTIS, PC A02/MF A01	DE83002073	MN -15	8:1818
82-2980	NTIS, PC A02/MF A01	DE83002084	MN -37	8:2903
82-2981	NTIS, PC A02/MF A01	DE83002083	MN -37	8:2904
82-2989	NTIS, PC A02/MF A01	DE83002080	MN -34B	8:3130
82-2990	NTIS, PC A02/MF A01	DE83002079	MN -20g	8:3730
82-2991	NTIS, PC A02/MF A01	DE83002078	MN -20g	8:3731
82-2994	NTIS, PC A03/MF A01	DE83002076	MN -20d	8:3824
82-3014	NTIS, PC A02/MF A01	DE83001976	MN -15	8:1819
82-3018	NTIS, PC A02/MF A01	DE83001975	MN -34C	8:1833
82-3076	NTIS, PC A02/MF A01	DE83001988	MN -34C	8:3279
LBL-				
11519	NTIS, PC A11/MF A01	DE83001545	MN -25	8:2581
12742	*See* DOE/BP-140	DE83001522	MN -95d	8:2458
13099	NTIS, PC A02/MF A01	DE83000544	STD -25	8:2582
13366	NTIS, PC A13/MF A01	DE83000879	STD -34	8:3258
14114	NTIS, PC A02/MF A01	DE83000496	MN -38	8:2905
14118	NTIS, PC A02/MF A01	DE83000499	MN -92a	8:1639
14127	NTIS, PC A05/MF A01	DE83000497	MN -32	8:3889
14223	NTIS, PC A11/MF A01	DE83001379	MN -61a	8:1926
14227	NTIS, PC A02/MF A01	DE83000514	MN -34	8:2653
14580	NTIS, PC A03/MF A01	DE83001360	MN -25	8:2654
14625	NTIS, PC A07/MF A01	DE83001533	MN -34	8:2683
14635	NTIS, PC A02/MF A01	DE82018730	MN -28	8:2796
14739	NTIS, PC A02/MF A01	DE83001361	MN -34B	8:2921
14750	NTIS, PC A05/MF A01	DE83001400	MN -25	8:2583
14751	NTIS, PC A04/MF A01	DE83000500	MN -25	8:2584
14824	NTIS, PC A02/MF A01	DE83000498	MN -34C	8:3502
14845	NTIS, PC A02/MF A01	DE83000513	MN -34	8:2585
14846	NTIS, PC A03/MF A01	DE83000494	MN -78	8:2307

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14857	NTIS, PC A02/MF A01	DE83000515	MN -28	8:3176
14864	NTIS, PC A08/MF A01	DE83000519	MN -34D	8:3321
14913	NTIS, PC A02/MF A01	DE83001553	MN -59	8:1877
LUMEDW/MERI-				
1014/ 1-46/ (1981)	*See* LUNFD6/NFRA-1014/1-46/(1981)	DE82702555	MN -48	8:3050
LUNFD6/NFRA-				
1014/ 1-46/ (1981)	NTIS (US Sales Only), PC A07/MF A01	DE82702555	MN -48	8:3050
MHD-III-				
82-101	NTIS, PC A02/MF A01	DE83000143	MN -90g	8:2445
MHSMP-				
82-33	NTIS, PC A02/MF A01	DE83001841	MN -45	8:2928
82-34	NTIS, PC A02/MF A01	DE83001802	MN -45	8:2929
82-37	NTIS, PC A02/MF A01	DE83001801	MN -45	8:2930
82-38	NTIS, PC A02/MF A01	DE83001842	MN -45	8:2931
MIT-EL-				
81-001	*See* PB-82-180175			8:1658
81-020	*See* PB-82-180241			8:2993
81-036	*See* PB-82-180316			8:3029
81-040	*See* PB-82-180332			8:2011
81-044	*See* PB-82-180324			8:2962
82-003	*See* PB-82-180183			8:2428
82-023	NTIS, PC A09/MF A01	DE82021227	MN -79e	8:2308
MLM-				
2944	NTIS, PC A02/MF A01	DE83000061	MN -25	8:2586
2995-OP	NTIS, PC A02/MF A01	DE82021313	MN -70	8:1826
2996-OP	NTIS, PC A02/MF A01	DE82021312	MN -34	8:2627
2997-OP	NTIS, PC A02/MF A01	DE82021323	MN -70	8:1743
3017(OP)	NTIS, PC A02/MF A01	DE83001537	MN -70B	8:1744
MRC-R-				
673	*See* AD-A-111984/1			8:3150
MSNWP-				
1079	*See* DOE/ET/33047-1	DE82022219	MN -34	8:2729
MTI-				
80ASE142DR1	*See* DOE/NASA/0032-17	DE83001746	MN -96	8:2535
80ASE142DR1	*See* DOE/NASA/0032-18	DE83001745	MN -96	8:2536
MTL/WDC-				
82-TR-517	NTIS, PC A06/MF A01	DE83002128	MN -90d	8:1548
MTR-				
81W00127	NTIS, PC A07/MF A01	DE83001429	MN -95e	8:2521
NAS-NS-				
3201	NTIS$11.25		STD -48	8:3051
NASA-CR-				
167936	*See* DOE/NASA/0032-17	DE83001746	MN -96	8:2535
167937	*See* DOE/NASA/0032-18	DE83001745	MN -96	8:2536
NASA-TM-				
82739	*See* DOE/NASA/10350-30	DE82022524	MN -90f	8:1530
82863	*See* DOE/NASA/51044-28	DE83001124	STD -96	8:2538
82900	*See* DOE/NASA/51044-25	DE83001577	STD -96	8:2537
82913	*See* DOE/NASA/12726-17	DE83000791	STD -94c	8:2447
82944	*See* DOE/NASA/20320-41	DE83001099	STD -60	8:2052
82985	*See* DOE/NASA/13111-11	DE83001399	STD -90f	8:1625
82987	*See* DOE/NASA/13111-12	DE83001100	STD -90f	8:1626
NBI-HE-				
82-17	NTIS (US Sales Only), PC A02/MF A01	DE82702988	MN -34D	8:3247
82-18	NTIS (US Sales Only), PC A03/MF A01	DE82702989	MN -34D	8:3248
82-20	NTIS (US Sales Only), PC A02/MF A01	DE82702990	MN -34D	8:3249
NBL-				
303	NTIS, PC A09/MF A01	DE83001789	MN -51	8:1683
NBSIR-				
82-2454	*See* PB-82-177288			8:2850
NE-F-				
9-4T-Rev.-9-82	Nuclear Standards Management Center, Oak Ridge, TN 37830		STD -80	8:2179
NE-M-				
7-6T-Rev.-9-82	Nuclear Standards Management Center, Oak Ridge, TN		STD -80	8:2178
NE-TEKNIK-				
82-8	*See* STUDSVIK-NR-82-82	DE82702547	MN -41	8:2330
NOSC/TR-				
683	*See* AD-A-112090/6			8:3042
NP-				
2904426	NTIS (US Sales Only), PC A04/MC A01	DE82904426	MN -95	8:2522
2904427	NTIS (US Sales Only), PC A03/MF A01	DE82904427	MN -95	8:2523
2904428	NTIS (US Sales Only), PC A07/MF A01	DE82904428	MN -25	8:1844
2904429	NTIS (US Sales Only), PC A07/MF A01	DE82904429	MN -97a	8:2090
2904430	NTIS (US Sales Only), PC A08/MF A01	DE82904430	MN -96	8:2482
2904431	NTIS (US Sales Only), PC A07/MF A01	DE82904431	MN -97d	8:2061
2904446	NTIS (US Sales Only), PC A05/MF A01	DE82904446	MN -38	8:2742
2904450	NTIS (US Sales Only), PC A05/MF A01	DE82904450	MN -38	8:2743
2904451	NTIS (US Sales Only), PC A07/MF A01	DE82904451	MN -88	8:1607
2904452	NTIS (US Sales Only), PC A03/MF A01	DE82904452	MN -95	8:2397
2904453	NTIS (US Sales Only), PC A03/MF A01	DE82904453	MN -95	8:2423
2904456	NTIS (US Sales Only), PC A08/MF A01	DE82904456	MN -62	8:2023
2904457	NTIS (US Sales Only), PC A07/MF A01	DE82904457	MN -97d	8:2427
2904458	NTIS (US Sales Only), PC A08/MF A01	DE82904458	MN -97a	8:2091
2904459	NTIS (US Sales Only), PC A06/MF A01	DE82904459	MN -88	8:1608

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2904712	NTIS (US Sales Only), PC A06/MF A01	DE82904712	MN -90c	8:1549
2904713	NTIS (US Sales Only), PC A10/MF A01	DE82904713	MN -88	8:2764
2904714	NTIS (US Sales Only), PC A05/MF A01	DE82904714	MN -58	8:2435
2904715	NTIS (US Sales Only), PC A02/MF A01	DE82904715	MN -92	8:1647
2904717	NTIS (US Sales Only), PC A06/MF A01	DE82904717	MN -90b	8:1566
2904718	NTIS (US Sales Only), PC A06/MF A01	DE82904718	MN -92b	8:1643
2904730	NTIS (US Sales Only), PC A04/MF A01	DE82904730	MN -90c	8:1562
2904731	NTIS (US Sales Only), PC A05/MF A01	DE82904731	MN -63	8:1927
2904732	NTIS (US Sales Only), PC A06/MF A01	DE82904732	MN -38	8:2744
2904733	NTIS (US Sales Only), PC A03/MF A01	DE82904733	MN -25	8:2655
2904734	NTIS (US Sales Only), PC A08/MF A01	DE82904734	MN -25	8:2587
2904735	NTIS (US Sales Only), PC A06/MF A01	DE82904735	MN -98A	8:1628
2904736	NTIS (US Sales Only), PC A06/MF A01	DE82904736	MN -88	8:2716
2904737	NTIS (US Sales Only), PC A07/MF A01	DE82904737	MN -88	8:1609
2904745	NTIS (US Sales Only), PC A06/MF A01	DE82904745	MN -95	8:2532
2905802	NTIS, PC A02/MF A01	DE82905802	MN -11	8:3111
3900009	Univ. of Mississippi, University, MS		MN -95	8:2381
3900290	NTIS, PC A03/MF A01	DE83900290	MN -59	8:2010
NRAES-				
13	Northeast Regional Agricultural Engineering Service, Ithaca, NY 14853		ND -61	8:1858
NRCN-				
505	NTIS (US Sales Only), PC A05/MF A01	DE82702993	MN -34A	8:2656
NRL-MR-				
4753	*See* AD-A-111910/6			8:3544
4767	*See* AD-A-111911/4			8:3545
4900	NTIS, PC A02/MF A01	DE83001730	STD -21	8:3825
NRPB-R-				
126	NTIS (US Sales Only), PC A03/MF A01; Also available from H.M. Stationery Office, price Pound3.00	DE82702545	MN -41	8:1789
127	NTIS (US Sales Only), PC A02/MF A01; Also available from H.M. Stationery Office, price Pound2.00	DE82702546	MN -41	8:3005
NUREG-				
0090-V3-N2	NTIS, PC A03/MF A01			8:2309
0390-V3-N1	NTIS, PC A09/MF A01			8:2169
0390-V4-N2	NTIS, PC A10/MF A01			8:2170
0566-V2-N2	NTIS, PC A10/MF A01			8:2171
0750-V13-N1	NTIS, PC A05/MF A01			8:2172
0845	NTIS, PC A09/MF A01			8:2173
0902	NTIS, PC A03/MF A01			8:1745
0909	NTIS, PC A15/MF A01			8:2310
NUREG/BR-				
0025-82/ 04	NTIS, PC A02/MF A01			8:1820
0025-82/ 05	NTIS, PC A02/MF A01			8:1821
NUREG/CR-				
2297	NTIS, PC A07/MF A01			8:1822
2444-Vol.2	GPO$15.00		MN -78	8:2311
2478-V1	NTIS, PC A12/MF A01			8:1746
2522	NTIS, PC A03/MF A01			8:2211
2529	NTIS, PC A12/MF A01			8:2073
2547	NTIS, PC A17/MF A01			8:1747
2603	NTIS, PC A05/MF A01			8:2312
2619	NTIS, PC A09/MF A01			8:2745
2625	NTIS, PC A03/MF A01			8:3006
2638	NTIS, PC A04/MF A01			8:2223
2761	NTIS, PC A06/MF A01 - GPO $6.50	DE83000532	MN -80	8:2313
2787	NTIS, PC A99/MF A01	DE83000708	MN -78	8:2314
2820	GPO$5.50		MN -15	8:1823
2873-Vol.2	NTIS, PC A16/MF A01		MN -41	8:1790
2898	GPO$7.50		MN -70	8:2315
NVO-				
249	NTIS, PC A05/MF A01	DE83001494	MN -11	8:2947
250	NTIS, PC A04/MF A01	DE83001418	STD -70	8:1748
NZERDC-				
78	NTIS (US Sales Only), PC A11/MF A01	DE83900210	MN -13	8:2372
NZERDC-P-				
58	NTIS (US Sales Only), PC A02/MF A01	DE82905454	MN -95d	8:2463
59	NTIS (US Sales Only), PC A03/MF A01	DE83900035	MN -13	8:2431
61	NTIS (US Sales Only), PC A04/MF A01	DE83900329	MN -61a	8:1931
ONRL-C-				
12-81	*See* AD-A-111898/3			8:3102
ONWI-				
202	NTIS, PC A06/MF A01	DE83000730	MN -70	8:1749
260	NTIS, PC A09/MF A01	DE83000728	MN -70	8:3112
277	NTIS, PC A05/MF A01	DE83000729	MN -70	8:3107
308	NTIS, PC A06/MF A01	DE83000733	MN -70	8:3113
ORAU-				
205	NTIS, PC A04/MF A01	DE83000799	MN -2	8:2096
ORNL-				
5791	NTIS, PC A05/MF A01	DE83001719	STD -79d	8:2159
5911	NTIS, PC A10/MF A01	DE83001718	MN -11	8:3036
ORNL/CON-				
99	NTIS, PC A09/MF A01	DE83001716	MN -95	8:2483
ORNL/CSD/TM-				
177	NTIS, PC A02/MF A01	DE83000420	MN -20a	8:3826

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ORNL/MIT-				
345	NTIS, PC A04/MF A01	DE83001679	MN -38	8:2588
350	NTIS, PC A04/MF A01	DE83001686	MN -25	8:2589
355	NTIS, PC A04/MF A01	DE83001637	MN -90d	8:1550
356	NTIS, PC A04/MF A01	DE83001680	MN -86	8:2767
358	NTIS, PC A04/MF A01	DE83001681	MN -4	8:2674
359	NTIS, PC A04/MF A01	DE83001699	MN -90d	8:1551
ORNL/Sub-				
79-13673/ 1	NTIS, PC A05/MF A01	DE83000983	MN -95	8:2750
81-9051/ 1	NTIS, PC A06/MF A01	DE83000401	MN -61	8:1932
81-21099-1-04	NTIS, PC A10/MF A01	DE83001503	MN -20	8:3827
81-21099-1-07	NTIS, PC A13/MF A01	DE83001501	MN -20	8:3828
81-21099/ 1-09	NTIS, PC A07/MF A01	DE83001502	MN -20	8:3829
7219/ 1	*See* DOE/ET/12313-4	DE83000875	MN -90h	8:2562
ORNL/TM-				
1138/ R1	NTIS, PC A21/MF A01	DE83000384	MN -80	8:2254
7680/ S1	NTIS, PC A04/MF A01	DE83001701	MN -41	8:1629
8177	NTIS, PC A03/MF A01	DE83001675	MN -2	8:2373
8178	NTIS, PC A03/MF A01	DE83001706	MN -2	8:2374
8262	NTIS, PC A08/MF A01	DE83001702	MN -62a	8:1975
8308-Add.1	NTIS, PC A09/MF A01	DE83001635	MN -80	8:2251
8348	NTIS, PC A06/MF A01	DE83001722	STD -77	8:1698
8372	NTIS, PC A03/MF A01	DE83000380	STD -70	8:1750
8385	NTIS, PC A05/MF A01	DE83001700	MN -90h	8:2505
8398	NTIS, PC A04/MF A01	DE83001717	STD -97b	8:2092
8408	NTIS, PC A03/MF A01	DE83000468	STD -90i	8:1574
8428	NTIS, PC A02/MF A01	DE83000424	MN -48	8:3074
8430	NTIS, PC A04/MF A01	DE83000470	STD -20a	8:3732
8434	NTIS, PC A03/MF A01	DE83000387	MN -80	8:2252
8436	NTIS, PC A03/MF A01	DE83000471	STD -20g	8:3733
8451	NTIS, PC A08/MF A01	DE83001682	MN -34	8:3540
8453	NTIS, PC A04/MF A01	DE83000421	MN -34A	8:3177
8481	NTIS, PC A05/MF A01	DE83001703	MN -88	8:1598
8486	NTIS, PC A04/MF A01	DE83001634	MN -95d	8:2464
8489	NTIS, PC A02/MF A01	DE83001684	STD -4	8:2363
8495	NTIS, PC A03/MF A01	DE83001674	MN -90i	8:1575
8507	NTIS, PC A03/MF A01	DE83001633	MN -32	8:3890
8518	NTIS, PC A02/MF A01	DE83001677	MN -80	8:2255
ORNL-tr-				
4879	NTIS, PC A02/MF A01	DE83000004	MN -10	8:2693
4889	NTIS, PC A02/MF A01	DE82021374	MN -48	8:3011
4896	NTIS, PC A02/MF A01	DE83000248	MN -11	8:3010
4903	NTIS, PC A02/MF A01	DE82021270	MN -11	8:3012
ORO-				
4043-42	*See* DOE/ER/04043-42	DE83000112	MN -34D	8:3261
5126-158	*See* DOE/ER/05126-158	DE83000808	MN -34C	8:3425
P-				
500-81-038	California Energy Commission, 1111 Howe Avenue, Sacramento, CA 95825		MN -95d	8:2506
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A 6,300,363				8:2737
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82-148750	NTIS PC $120.75/MF $10.25			8:2484
82-148768	NTIS PC $131.00/MF $10.75			8:2485
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82-174459	NTIS, PC A02/MF A01			8:3091
82-174905	NTIS, PC A03/MF A01			8:2492
82-177288	NTIS, PC A07/MF A01			8:2850
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82-178963	NTIS, PC A09/MF A01			8:1577
82-180027	NTIS, PC A99/MF E01			8:2391
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82-180183	NTIS, PC A04/MF A01			8:2428
82-180241	NTIS, PC A18/MF A01			8:2993
82-180316	NTIS, PC A07/MF A01			8:3029
82-180324	NTIS, PC A06/MF A01			8:2962
82-180332	NTIS, PC A03/MF A01			8:2011
82-182452	NTIS, PC A05/MF A01			8:3092
82-183021	NTIS, PC A04/MF A01			8:2074
82-183880	NTIS, PC A07/MF A01			8:2541
82-183997	NTIS, PC A03/MF A01			8:2045

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82-184003	NTIS, PC A03/MF A01			8:2046
82-184748	NTIS, PC A04/MF A01			8:3131
82-184961	NTIS, PC A11/MF A01			8:2546
82-185158	NTIS, PC A05/MF A01			8:3052
82-185570	NTIS, PC A17/MF A01			8:1610
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82-185596	NTIS, PC A16/MF A01			8:1612
82-185604	NTIS, PC A16/MF A01			8:1613
82-185612	NTIS, PC A18/MF A01			8:1614
82-185851	NTIS, PC A02/MF A01			8:2465
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82-186792	NTIS, PC A21/MF A01			8:3093
82-187170	NTIS, PC A03/MF A01			8:3148
82-187337	NTIS, PC A05/MF A01			8:2963
82-187345	NTIS, PC A07/MF A01			8:2964
82-187444	NTIS PC E03/MF E03			8:1969
82-188087	NTIS, PC A08/MF A01			8:2356
82-188095	NTIS, PC A04/MF A01			8:2017
82-188186	NTIS, PC A13/MF A01			8:1670
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82-190729	NTIS, PC A10/MF A01			8:2968
82-190935	NTIS, PC A04/MF A01			8:1659
82-190968	NTIS, PC A04/MF A01			8:1784
82-190976	NTIS PC E04/MF E04			8:2030
82-190984	NTIS PC E05/MF E05			8:2466
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82-191107	NTIS, PC A05/MF A01			8:2467
82-191115	NTIS PC E04/MF E04			8:2226
82-192097	NTIS, PC A05/MF A01			8:2969
82-192139	NTIS, PC A05/MF A01			8:2076
82-192147	NTIS, PC A05/MF A01			8:2970
82-192220	NTIS, PC A99/MF E05			8:3030
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82-193053	NTIS, PC A05/MF A01			8:1580
82-193111	NTIS, PC A06/MF A01			8:2971
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82-193624	NTIS, PC A04/MF A01			8:1567
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82-194937	NTIS, PC A03/MF A01			8:2533
82-195009	NTIS, PC A03/MF A01			8:2922
82-195066	NTIS, PC A03/MF A01			8:2065
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82-195314	NTIS, PC A03/MF A01			8:1673
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82-195595	NTIS PC E08/MF E08			8:2449
82-195694	NTIS, PC A02/MF A01			8:1594
82-195702	NTIS, PC A06/MF A01			8:2975
82-195835	NTIS, PC A05/MF A0			8:2511
82-195843	NTIS, PC A09/MF A01			8:2540
82-195900	NTIS, PC A08/MF A01			8:2765
82-195918	NTIS, PC A20/MF A01			8:2078
82-195934	NTIS, PC A11/MF A01			8:2044
82-195942	NTIS, PC A16/MF A01			8:3016
82-195959	NTIS, PC A03/MF A01			8:3097
82-195967	NTIS, PC A05/MF A01			8:3098

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82-196205	NTIS, PC A06/MFA01			8:2675
82-196247	NTIS, PC A08/MF A01			8:2079
82-196304	NTIS, PC A13/MF A01			8:1649
82-196395	NTIS, PC A12/MF A01			8:3149
82-196593	NTIS, PC A99/MF A01			8:1671
82-196627	NTIS, PC A03/MF A01			8:1632
82-196684	NTIS PC E03/MF E03			8:2338
82-196692	NTIS PC E03/MF E03			8:1970
82-197088	NTIS, PC A05/MF A01			8:2996
82-197096	NTIS, PC A10/MF A01			8:2997
82-197187	NTIS, PC A07/MF A01			8:2977
82-197195	NTIS, PC A03/MF A01			8:2978
82-197351	NTIS, PC A99/MF A01			8:1650
82-197518	NTIS, PC A08/MF A01			8:2979
82-197872	NTIS, PC A05/MF A01			8:2980
82-197898	NTIS, PC A05/MF A01			8:1933
82-197971	NTIS, PC A11/MF A01			8:1875
82-198045	NTIS, PC A09/MF A01			8:2066
82-198102	NTIS, PC A05/MF A01			8:2392
82-198110	NTIS, PC A06/MF A01			8:2393
82-198219	NTIS, PC A03/MF A01			8:2525
82-198417	NTIS, PC A03/MF A01			8:2981
82-198508	NTIS, PC A13/MF A01			8:2982
82-198763	NTIS, PC A04/MF A01			8:2080
82-198813	NTIS, PC A05/MF A01			8:3086
82-198839	NTIS PC E03/MF E03			8:1881
82-198854	NTIS PC E08/MF E08			8:2512
82-199134	NTIS, PC A02/MF A01			8:2067
82-199159	NTIS PC E05/MF E05			8:1693
82-199167	NTIS PC E05/MF E05			8:2376
82-199191	NTIS PC E04/MF E04			8:1825
82-199217	NTIS PC E07/MF E07			8:2534
82-199738	NTIS, PC A09/MF A01			8:1627
82-199753	NTIS, PC A20/MF A01			8:1651
82-199761	NTIS, PC A18/MF A01			8:1652
82-199787	NTIS, PC A03/MF A01			8:3075
82-200098	NTIS, PC A03/MF A01			8:2368
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82-200205	NTIS PC E04/MF E04			8:2418
82-200221	NTIS PC E04/MF E04			8:2377
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82-200346	NTIS, PC A16/MF A01			8:2469
82-200486	NTIS, PC A05/MF A01			8:1616
82-200510	Commission of the European Communities, Luxembourg			8:1883
82-200544	NTIS, PC A08/MF A01			8:2526
82-200650	NTIS, PC A05/MF A01			8:2508
82-200668	NTIS, PC A08/MF A01			8:2763
82-200692	NTIS, PC A12/MF A01			8:2414
82-200932	NTIS, PC A05/MF A01			8:3132
82-201336	NTIS, PC A03/MF A01			8:1633
82-201963	NTIS PC E09/MF E09			8:1795
82-202235	NTIS, PC A02/MF A01			8:1617
82-203092	NTIS, PC A05/MF A01			8:2470
82-204447	NTIS, PC A07/MF A01			8:2239
82-204868	NTIS, PC A04/MF A01			8:1618
82-204983	NTIS PC E05/MF E05			8:1785
82-205410	NTIS PC E09/MF E09			8:2419
82-205428	NTIS PC E03/MF E03			8:3027
82-205436	NTIS PC E05/MF E05			8:1845
82-205444	NTIS PC E05/MF E05			8:1843
82-207267	NTIS, PC A03/MF A01			8:2751
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82-208273	NTIS, PC A05/MF A01			8:1581
82-209644	NTIS, PC A15/MF A01			8:2984
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82-212754	NTIS, PC A03/MF A01			8:2509
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82-212861	NTIS PC E05/MF E05			8:2477
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010-82	NTIS PC E07/MF $5.00	DE82022282	MN -51	8:1684
044-82	NTIS PC E07/MF $4.60	DE83000600	MN -51	8:1685
049-82	NTIS PC E07/MF $5.00	DE83001223	MN -51	8:1686
055-82	NTIS PC E07/MF $4.40	DE82022283	MN -51	8:1687
078-82	NTIS PC E12/MF $8.75	DE83000950	MN -51	8:1688
079-82	NTIS PC E10/MF $6.80	DE82022281	MN -51	8:1689
083-82	NTIS PC E08/MF $5.20	DE83000765	MN -51	8:1690
093-82	NTIS PC E09/MF A01	DE83001221	MN -51	8:1691
096-82	NTIS PC E08/MF A01	DE83001222	MN -51	8:1692

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PNL-				
3736	NTIS, PC A13/MF A01	DE83000881	MN -41	8:2906
3991	NTIS, PC A20/MF A01	DE83000880	MN -11	8:1644
4014	NTIS, PC A20/MF A01	DE83000914	MN -11	8:1663
4036-Vol.2	*See* NUREG/CR-2873-Vol.2		MN -41	8:1790
4090	NTIS, PC A07/MF A01	DE82022495	MN -92	8:1664
4133	NTIS, PC A07/MF A01	DE83000882	MN -11	8:1665
4197	*See* DOE/ET/34215-25	DE83000448	STD -78	8:2099
4224	*See* DOE/ET/34215-27	DE83001002	MN -78	8:2100
4230	NTIS, PC A04/MF A01	DE83000941	MN -90i	8:1552
4254	NTIS, PC A03/MF A01	DE83001732	MN -70	8:1751
4255	NTIS, PC A05/MF A01	DE82022544	MN -11	8:2384
4278	NTIS, PC A04/MF A01	DE83001578	MN -41	8:3008
4314	NTIS, PC A04/MF A01	DE83000304	MN -2	8:2256
4361	NTIS, PC A04/MF A01	DE83000944	MN -60	8:2048
4366	NTIS, PC A07/MF A01	DE83001692	MN -70	8:1752
4416-Vol.1	NTIS, PC A03/MF A01	DE83001438	MN -95f	8:2510
4428-Vol.1	NTIS, PC A04/MF A01	DE83000925	MN -70	8:1753
4428-Vol.2	NTIS, PC A10/MF A01	DE83001805	MN -70	8:1754
4431	NTIS, PC A04/MF A01	DE83001493	MN -60	8:2053
4457	NTIS, PC A05/MF A01	DE83001691	MN -91	8:1677
PNL-SA-				
9954-Rev.1	NTIS, PC A02/MF A01	DE83002071	MN -61a	8:1935
10076	NTIS, PC A02/MF A01	DE83002017	MN -94e	8:2347
10153	NTIS, PC A02/MF A01	DE83002042	MN -80	8:2104
10166	NTIS, PC A02/MF A01	DE83002057	MN -94e	8:2348
10290	NTIS, PC A03/MF A01	DE83002072	MN -70	8:1755
10295	NTIS, PC A02/MF A01	DE83002015	MN -70	8:1756
10300	NTIS, PC A02/MF A01	DE83002014	MN -20c	8:3830
10341	NTIS, PC A02/MF A01	DE83002007	MN -78	8:2105
10350	NTIS, PC A02/MF A01	DE83002033	MN -61a	8:1936
10369	NTIS, PC A02/MF A01	DE83002052	MN -80	8:2174
10370	NTIS, PC A02/MF A01	DE83002050	MN -80	8:2175
10371	NTIS, PC A02/MF A01	DE83002070	MN -78	8:2176
10372	NTIS, PC A02/MF A01	DE83002023	MN -70A	8:1712
10423	NTIS, PC A02/MF A01	DE83002029	MN -11	8:3021
10446	NTIS, PC A02/MF A01	DE83002036	MN -13	8:2752
10531	NTIS, PC A02/MF A01	DE83002058	MN -94e	8:2357
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10584	NTIS, PC A02/MF A01	DE83002002	MN -95d	8:2471
10591	NTIS, PC A02/MF A01	DE83002059	MN -94e	8:2349
10593	NTIS, PC A02/MF A01	DE83002041	MN -94e	8:2350
10636	NTIS, PC A02/MF A01	DE83002003	MN -94e	8:2358
10644	NTIS, PC A02/MF A01	DE83002008	MN -95d	8:2472
10700	NTIS, PC A02/MF A01	DE83002038	MN -70B	8:1757
10701	NTIS, PC A02/MF A01	DE83002044	MN -70B	8:1758
PPPL-				
1922	NTIS, PC A03/MF A01	DE83001392	STD -20	8:3831
1928	NTIS, PC A03/MF A01	DE83001393	STD -20	8:3734
1937	NTIS, PC A04/MF A01	DE83001391	STD -20f	8:3832
1942	NTIS, PC A02/MF A01	DE83002295	STD -20a	8:3833
1944	NTIS, PC A02/MF A01	DE83001396	STD -20	8:3735
1950	NTIS, PC A03/MF A01	DE83002335	STD -20f	8:3736
PRI-				
51	*See* SAI-254-82-274-LJ	DE83001001	STD -20g	8:3737
PSI-TR-				
315	*See* DOE/MC/16242-4	DE83001870	MN -93	8:2441
PTB-FMRB-				
85	NTIS (US Sales Only), MF A01	DE82750524	MN -37	8:2911
86	NTIS (US Sales Only), MF A01	DE82750525	MN -70	8:1759
87	NTIS (US Sales Only), MF A01	DE82750522	MN -80	8:2253
88	NTIS (US Sales Only), MF A01	DE82750523	MN -70	8:1760
PTB-L-				
15	NTIS (US Sales Only), MF A01	DE82750545	MN -02	8:2398
PWA-				
19/ 81	*See* KFK-3188	DE82750201	MN -04	8:1708
RERF-TR-				
8-79	NTIS (US Sales Only), PC A02/MF A01	DE82702551	MN -41	8:3076
RFP-				
3267	NTIS, PC A02/MF A01	DE83000689	MN -15	8:1761
3320	NTIS, PC A06/MF A01	DE83000076	MN -41	8:2385
3378	*See* DOE/TRU-8202	DE83001529	STD -70	8:1726
3380	NTIS, PC A02/MF A01	DE83001103	STD -37	8:2923
3391	NTIS, PC A02/MF A01	DE83001327	STD -37	8:2912
RFP-Trans-				
325	NTIS, PC A02/MF A01	DE82021723	MN -11	8:3023
326	NTIS, PC A02/MF A01	DE82021722	MN -11	8:3024
336	NTIS, PC A02/MF A01	DE82020135	MN -25	8:2614
340	NTIS, PC A02/MF A01	DE82021036	MN -38	8:1968
RH-				
80-2-BF1	*See* TVA/PUB-83/1	DE83900057	MN -41	8:2242
81-1-BF-1	*See* TVA/PUB-83/3	DE83900055	MN -41	8:2243

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220P	NTIS, PC A02/MF A01	DE83000718	MN -70	8:1762
243-P	NTIS, PC A02/MF A01	DE83001484	MN -70	8:1763
248-P	NTIS, PC A02/MF A01	DE83001753	MN -70	8:1764
250-P	NTIS, PC A02/MF A01	DE83001754	MN -70	8:1765
276P	NTIS, PC A03/MF A01	DE83002108	MN -11	8:1766
RHO-BWI-C-				
107-Vol.1	NTIS, PC A09/MF A01	DE83000973	MN -70	8:1767
107-Vol.2	NTIS, PC A09/MF A01	DE83000972	MN -70	8:1768
RHO-BWI-LD-				
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HN	Honduras
HT	Haiti
HU	Hungary
HV	Upper Volta
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IB	International Bank for Reconstruction and Development
ID	Indonesia
IE	Ireland
IG	Inter-Governmental Maritime Consultative Organization
II	International Commission on Radiation Units and Measurements
IL	Israel

IN	India
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UF	United Nations Children's Fund
UG	Uganda
UI	United Nations Industrial Development Organization
US	United States of America (USA)
UY	Uruguay
VA	Holy See
VD	Democratic Republic of Viet-Nam
VE	Venezuela
VS	Republic of Viet-Nam
WM	World Meteorological Organization
WS	Western Samoa
XA	International Atomic Energy Agency (IAEA)
XC	European Organization for Nuclear Research (CERN)
XE	Commission of the European Communities (CEC)
XF	Food and Agriculture Organization of the United Nations (FAO)
XJ	Joint Institute for Nuclear Research (JINR)
XM	Council for Mutual Economic Assistance (CMEA)
XN	Nuclear Energy Agency of the OECD (NEA)
XO	Organization of African Unity (OAU)
XR	International Commission on Radiological Protection (ICRP)
XS	International Organization for Standardization (ISO)
XU	United Nations (UN)
XW	World Health Organization (WHO)
XX	World Energy Conference (WEC)
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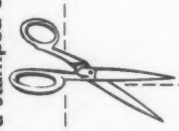

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